Central Coast Juvenile Herring Survey, August 2008

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by

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ABSTRACT

Thompson, M., Fort, C., and Therriault, T.W. 2010. Central Coast juvenile herring survey, August 2008. Can. Manuscr. Rep. Fish. Aquat. Sci. 2917: vi + 52 p.

In 2008, a Central Coast juvenile herring survey was conducted from August 10-22. Fifty-nine sets were made at 13 locations within Statistical Management Areas 6, 7, 8 and 9. The study area extended from Meyers Passage in the north to Rivers Inlet in the south. The survey serves to address information gaps on the distribution, abundance, size and feeding habits of juvenile herring in these nearshore, northern waters.

Twenty species of fish were identified in all purse seine catches with Pacific herring (*Clupea pallasi*) being the most frequently encountered species. A total of 6117 herring were measured resulting in a length frequency distribution that was distinctly bimodal representing age-0+ and age-1+ fish. Age-0+, age-1+, and age-2+ or older herring occurred in 98.3%, 79.7%, and 1.7% of the sets, respectively. Two oblique plankton tows were performed at each of the 13 locations resulting in a total of 26 tows during the survey. *Acartia longimeres* and larvaceans (*Oikopleura sp.* and *Fritillaria sp.*) occurred in all samples, and *Acartia longimeres*, euphausiid eggs and barnacle larvae showed up in the largest biomass. Twenty-six CTD casts also were performed during the survey to document oceanographic conditions.

RÉSUMÉ

Thompson, M., Fort, C., and Therriault, T.W. 2010. Central Coast juvenile herring survey, August 2008. Can. Manuscr. Rep. Fish. Aquat. Sci. 2917: vi + 52 p.

En 2008, une campagne de recensement portant sur les stocks de harengs juvéniles de la partie centrale de la côte a été effectuée entre le 10 et le 22 août. Au total, 59 traits de senne ont été réalisés à 13 endroits différents des zones de gestion statistiques 6, 7, 8 et 9. Le secteur couvert s'étendait du passage Meyers, au nord, à l'inlet Rivers, au sud. Le relevé vise à combler les lacunes dans les données sur la répartition, l'abondance, la taille et les habitudes alimentaires des harengs juvéniles dans ces eaux littorales du nord.

En tout, 20 espèces de poissons ont été dénombrées dans les ponctions effectuées, le hareng du Pacifique (*Clupea pallasi*) étant l'espèce la plus souvent représentée, et 6 117 harengs ont été mesurés. Les résultats indiquent une distribution nettement bimodale e la fréquence des longueurs, représentant la prédominance des individus d'âge 0+ et d'âge 1+. Les harengs des classes d'âge 0+, 1+ et 2+ correspondaient respectivement à 98,3 %, 79,7 % et 1,7 % des poissons récoltés dans les traits. Deux traits obliques de filets à plancton ont été effectués à chacun des 13 endroits, pour un total de 26 traits. *Acartia longimeres* et des larvacés (*Oikopleura* sp. et *Fritillaria* sp.) étaient présents dans tous les échantillons, alors que *Acartia longimeres*, des œufs d'euphausiacés et des larves de bernache constituaient la biomasse la plus élevée. Enfin, 26 profils verticaux de STD ont été réalisés en concomitance avec les opérations de recensement, pour documenter les conditions océanographiques.

INTRODUCTION

Pacific herring (*Clupea pallasi*) are an important commercial species and a vital forage fish for many marine mammals, birds and other fish in British Columbia's coastal waters. Herring spawn principally on marine vegetation in the subtidal and upper intertidal zone between February and June, with peak spawning between March and April (Humphreys and Hourston 1978). Larvae hatch in two to three weeks, and disperse with surface currents, metamorphosing into juvenile herring at a length of ~25mm (Hourston and Haegele 1980). Juvenile herring consist of two distinct age classes, age-0+ and age-1+, with recruitment for this species occurring at age 3 when they join the sexually mature spawning population (Hay and McCarter 1999). During daylight hours, juvenile herring congregate in schools, occasionally forming mixed aggregates with other pelagic species, close to shore near the bottom (Haegele 1997). At dusk, these fish migrate into surface waters to feed on plankton. During this time they are vulnerable to purse seine gear.

Relatively little is known about the distribution, abundance, size and feeding habits of juvenile herring in the Central Coast of British Columbia (Figure 1). In 2002-2004, 2007 and 2008 juvenile herring surveys were designed to address information gaps and learn about the general biology of herring in this northern geographical area. The survey used an ecosystem based approach to biological sampling. Therefore, in addition to juvenile herring, all other fish species were retained for analyses. Also, plankton samples and oceanographic data samples were collected. This approach will potentially provide a better understanding of the role and relationships juvenile herring have in Central Coast waters, and may provide an empirical forecast of recruitment to the herring roe fishery based on relative juvenile abundance (Schweigert et. al. 2009).

METHODS

In 2008, the Central Coast juvenile herring survey was conducted from August 10-22. Fifty-nine sets were made at 13 locations within Statistical Management Areas 6, 7, 8, and 9 (Table 1). The study area extended from Meyers Passage in the north to Rivers Inlet in the south (Figures 2 and 3). The 2008 set locations followed the 2007 survey (Thompson and Therriault 2009). The sampling sites originally were chosen based on known historical herring spawning sites, and represent both nearshore and open water habitats (Haegele and Armstrong 2003).

Fish Sampling

The 12 m, aluminium-hulled Fisheries Research Vessel *Walker Rock* was used for all fishing events. A 183 m long and 27 m deep purse seine net of knotless web, resulting in an area fished of ~2665 m^2, was used for all fishing events. The body of the net had 46 m of 22.2 mm mesh at the tow end followed by 91 m of 19.0 mm mesh, and the bunt end was 46 m of 9.5 mm mesh. The net fished to a depth of 10 m, and was able to retain fish greater than 20 mm in length. All sets were made after dusk when herring are feeding

near the surface. All sets were made "blind" at predetermined set locations. Five sets were completed per night for all locations. One set was cancelled in Rivers Inlet (set code 14) due to a fast surface tide and all five sets were lost in Thompson Bay (set code 5) due to the net getting caught in the wheel. For most sets, it was possible to land the entire catch for biological sampling. On occasion, it was not practical to land a large set in its entirety, so sub-sampling was necessary. When sub-sampling was required, a herring bucket was filled with randomly selected fish and retained for biological sampling. Several dipnet samples from various parts of the net (catch) would be used to make up the random sub-sample. The remainder of the set was released over the corkline, its size estimated as the number of buckets released. The number of herring caught in each set was determined by multiplying the sub-sample herring weight and number by the number of estimated buckets released (total catch). The number of other species caught in the sub-sample was determined in the same manner (Table 2). All fish retained for sampling were weighed, bagged and preserved in a 3.7 % seawater formalin solution, with the exception of large predator species (e.g., adult salmon, dogfish and mackerel). These fish were individually weighed and measured in the field. Retained samples were taken back to the Pacific Biological Station for laboratory analysis.

From each set, 100 or more herring from each represented age-class and all other fish species caught were identified, weighed and measured. If the set contained less than 200 herring, then all herring were weighed and measured. Consistent with standard practices, herring were measured to standard length; salmon to fork length; dogfish, hake and pollock to total length. All other fish species were measured to standard length.

Plankton Sampling

Twenty-six stepped oblique plankton tows were performed during the survey (Figures 4 and 5). Two plankton samples were taken from each location, one sample "nearshore" and the other "offshore or channel". The tows were completed after dusk and immediately before fishing events. Dual 19 cm diameter bongo nets with 350 μm mesh were used for sampling, resulting in 'left' and 'right' bongo plankton samples (only left samples were processed). The bongos were lowered to 20m and raised by an electric winch at a rate of 1m every 15 seconds. A General Oceanics® 2030R model flowmeter was attached to the left bongo to determine the volume of seawater filtered. Volume filtered was calculated using the following equation (McCarter and Hay 2002):

$$\mathbf{V = (A \cdot F \cdot K) / 999{,}999}$$

Where:

V = volume of water filtered through the plankton net (m^3)
A = area of net opening (0.02835 m^2)
F = number of revolutions recorded by the flow meter (m)
K = standard speed rotor constant for 7cm rotor (26,873)

Upon retrieval, the bongo nets were washed with a high pressure deck hose, and the samples preserved in 3.7 % seawater formalin.

In the laboratory, a volumetric splitter was used to reduce the sample size to a point where organisms could be conveniently counted and identified in a counting tray using a stereo microscope under 30X magnification. Sample splitting continued until a target size of roughly 300 organisms was reached (Thompson et al. 2003).

When possible, plankters were identified to the lowest taxonomic level. Copepods were identified to species. Densities for all plankters were determined and expressed as plankters $\cdot m^{-3}$.

CTD Sampling

To characterize oceanographic conditions in the surveyed area, a total of 26 CTD (conductivity – temperature – density) casts were made using a RBR XR-620 (Figures 4 and 5). Two CTD cast was performed at each location before plankton sampling. The CTD unit was weighted and lowered over the side of the vessel to within a few meters of the bottom to give the largest water profile possible. Descent rate of the CTD is close to 1 m/sec. Data was subsequently downloaded to a laptop computer from the CTD unit each evening.

RESULTS

Fifty-nine sets were made during the 2008 survey; four in section 101 (Rivers Inlet), five in section 091 (Fish Egg Inlet), five in section 085 (Kwakshua Channel), five in section 076 (Kildidt Sound), ten in section 067 (Kitasu Bay and Meyers Passage), five in section 077 (East Higgins Pass), ten in section 072 (Powell Anchorage and Spiller Channel), five in section 073 (Hunter Channel), five in section 084 (Burke Channel), and five in section 081 (Dean Channel). All set locations correspond to set locations used in the 2007 Central Coast survey (Figures 2 and 3, Table 1). One set was cancelled in Rivers Inlet due to a fast surface tide and all five sets were lost in Thompson Bay due to the net getting caught in the wheel.

Twenty species of fish and one invertebrate species were identified in the purse seine catches. The most frequently encountered species (>40% occurrence) included: Pacific herring, Pacific sardine and juvenile walleye pollock (Tables 2 and 3).

Herring

A total of 6117 herring were measured resulting in a bimodal length-frequency distribution. Based on this length-frequency distribution (Figure 6), the length designations for the two juvenile herring age-classes are:

0+ = herring less than or equal to 91 mm standard length
1+ = herring between 92 mm and 162 mm standard length
2+ and older = herring greater than or equal to 163 mm standard length

Figure 7 shows length frequency histograms for all sampling locations. Spiller Channel (set code 10), Hunter Channel (set code 11), Burke Channel (set code 12) and Dean Channel (set code 13) all had larger age-0+ herring when compared to the mean. This resulted in a partial bimodal distribution for the age-0+ herring (Figure 6).

Age-0+ herring occurred in 58 of the 59 sets (98.3 % occurrence; Table 3). Table 4 shows the average length and weight for age-0+ herring, and the total herring catch weight at each set location. The mean length and weight of all sampled age-0+ herring (n=4735) was 58 mm and 2.31 g respectively.

Age-1+ herring occurred in 47 of the 59 sets (79.7 % occurrence; Table 3). Table 4 shows the average length and weight for age-1+ herring, and the total herring catch weight at each set location. The mean length and weight of all sampled age-1+ herring (n=1378) was 124 mm and 27.27 g respectively.

Age-2+ herring occurred in 1 of the 59 sets (only 1.7 % occurrence; Table 3). Table 4 shows the average length and weight for age-2+ herring, and the total herring catch weight at each set location. The mean length and weight of all sampled age-2+ herring (n=4) was 173 mm and 70.55 g respectively.

The relationship between length and weight for all sampled herring was determined by fitting a logistic function to the length-weight data (Figure 8). Kildidt Sound and Dean Channel sets resulted in the least amount of herring caught in relation to total catch. East Higgins Pass, Hunter Channel and Meyers Pass sets resulted in the highest amount of herring caught (Table 2 and 4). Meyers Pass had a single set of 1000 Kg of age-0+ herring.

Plankton

There were 24 categories of organisms identified in 26 plankton samples (Tables 5 and 6). An average of 16.6031 m^3 of water was filtered per plankton tow. Copepods occurred in all samples. *Acartia longimeres* and larvaceans (*Oikopleura sp.* and *Fritillaria sp.*) were the only organisms to occur in all samples. *Acartia longimeres*, larvaceans (*Oikopleura sp.* and *Fritillaria sp.*), shrimp larvae, barnacles, and *Pseudocalanus sp.* occurred in >90 % of samples (Table 7). *Acartia longimeres*, euphausiid eggs and barnacles made up >55 % of all zooplankton biomass captured.

CTD

Two CTD casts were performed at each location before plankton sampling. The CTD provided a range of data for temperature (^{o}C), salinity (ppt), dissolved oxygen (%) and depth (m) (Figure 9). This is only the second year that CTD casts have been made; therefore, we have limited data for making broad observations relative to offshore ocean conditions in our sampling areas.

CONCLUSION

Fifty-nine stations were sampled resulting in 20 different fish species being recorded from the purse seine sets. A total of 6117 herring were measured and weighed creating a distinct bimodal histogram representing two juvenile herring age groups. Twenty-six plankton tows were performed with all plankton samples being processed. This resulted in *Acartia longimeres* and larvaceans (*Oikopleura sp.* and *Fritillaria sp.*) occurring in all samples and *Acartia longimeres*, euphausiid eggs and barnacles showing up in the largest biomass.

ACKNOWLEDGMENTS

This study was funded by Fisheries and Oceans Canada (DFO) along with vessel support and laboratory facilities. The research vessel was skippered by Don Houston. Don provides many years of valuable experience as a herring fisherman and knowledge of the Central Coast. All plankton samples were processed by Carol Cooper of Zotec Services.

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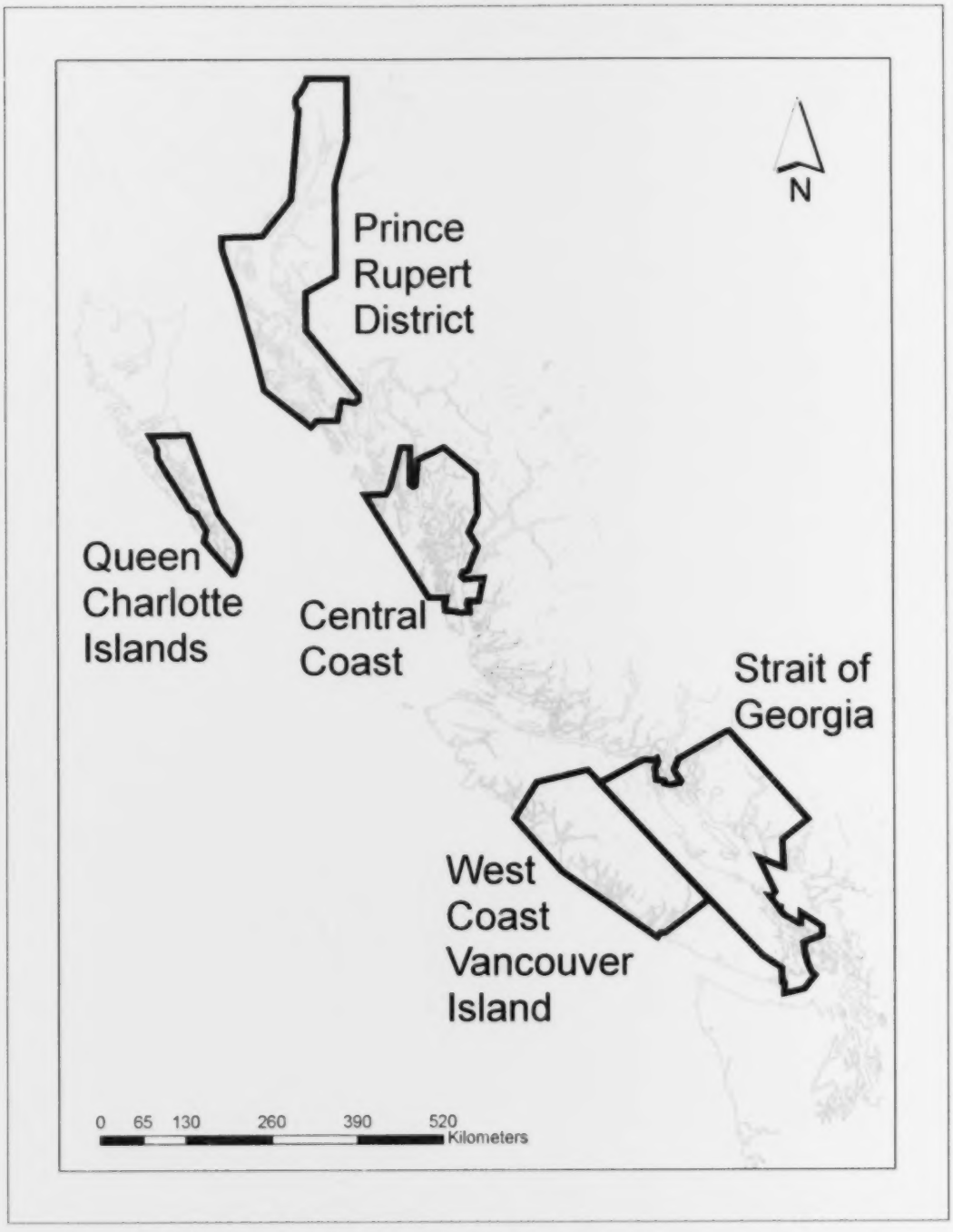


Figure 1. The five major British Columbia herring stock assessment areas.

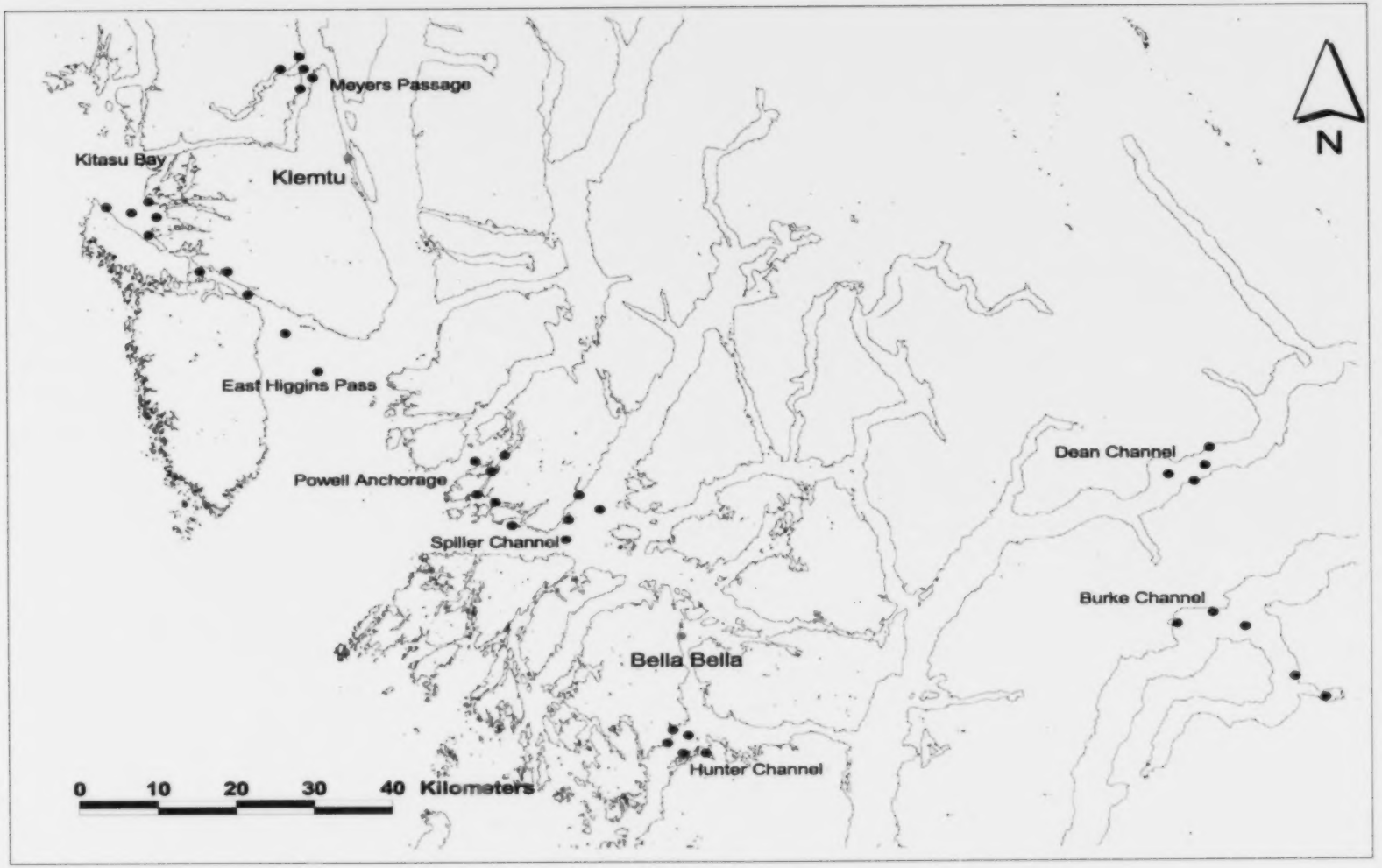


Figure 2. Upper Central Coast purse seine set locations for the 2008 juvenile herring survey.

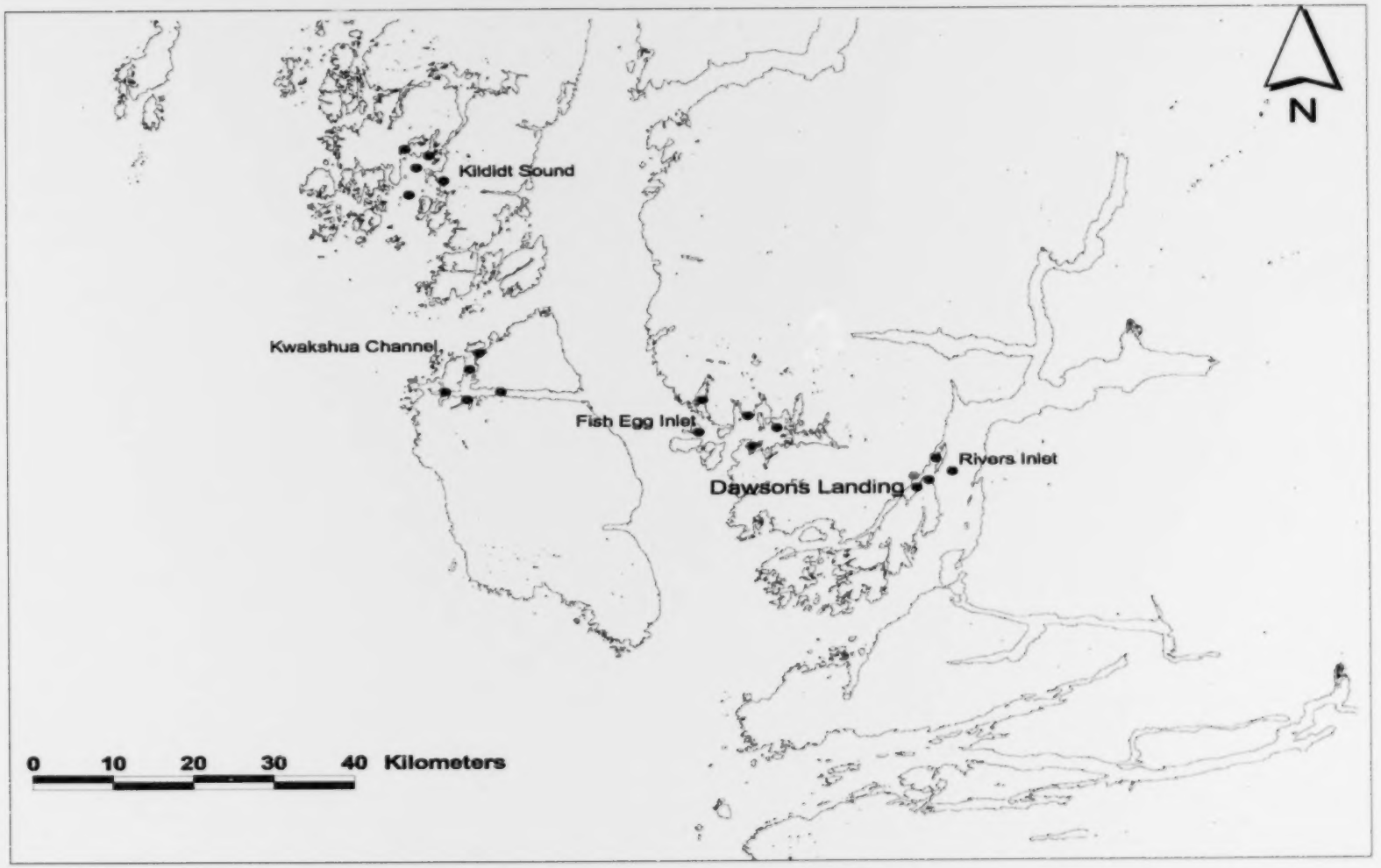


Figure 3. Lower Central Coast purse seine set locations for the 2008 juvenile herring survey.

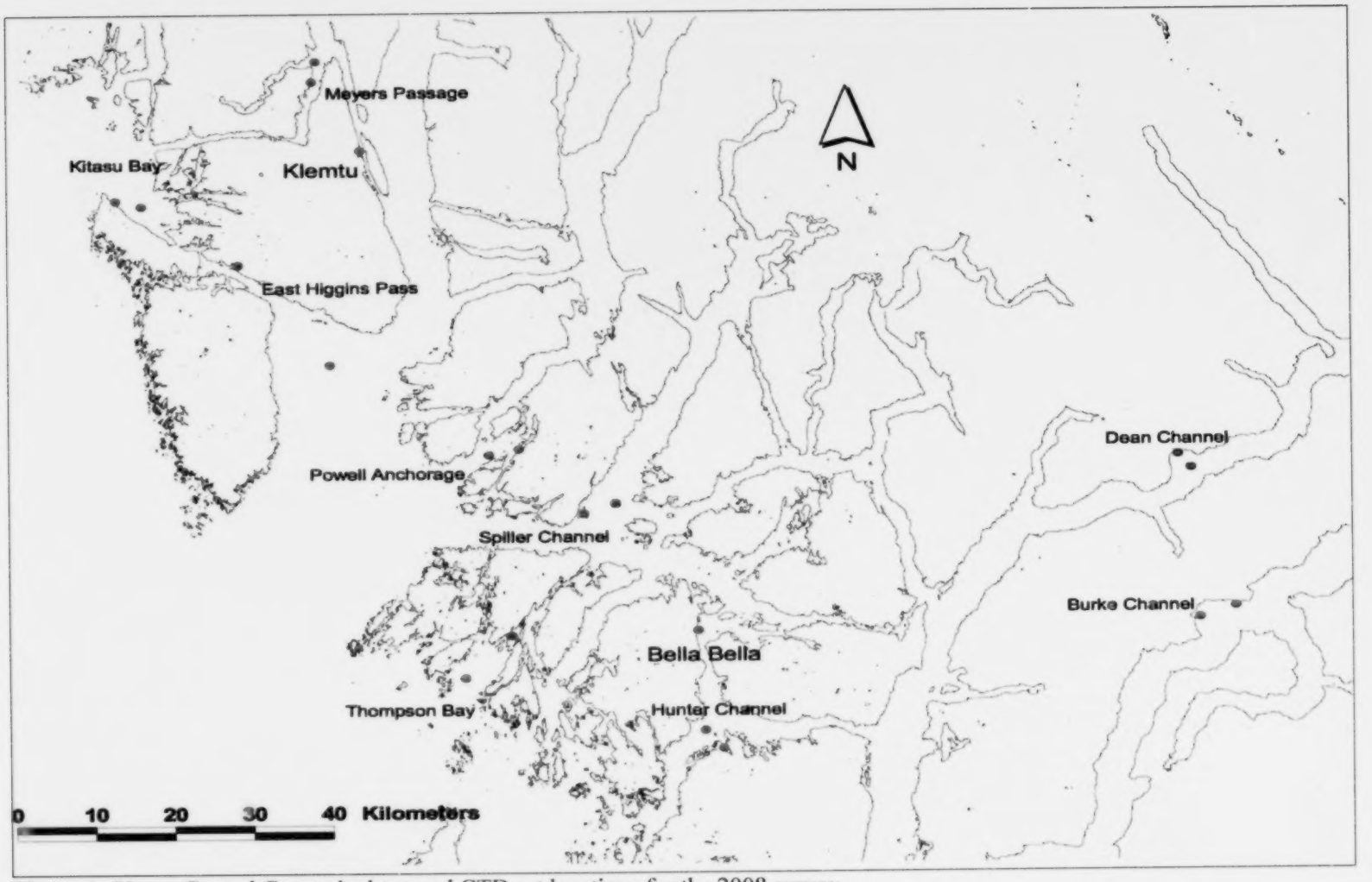


Figure 4. Upper Central Coast plankton and CTD set locations for the 2008 survey.

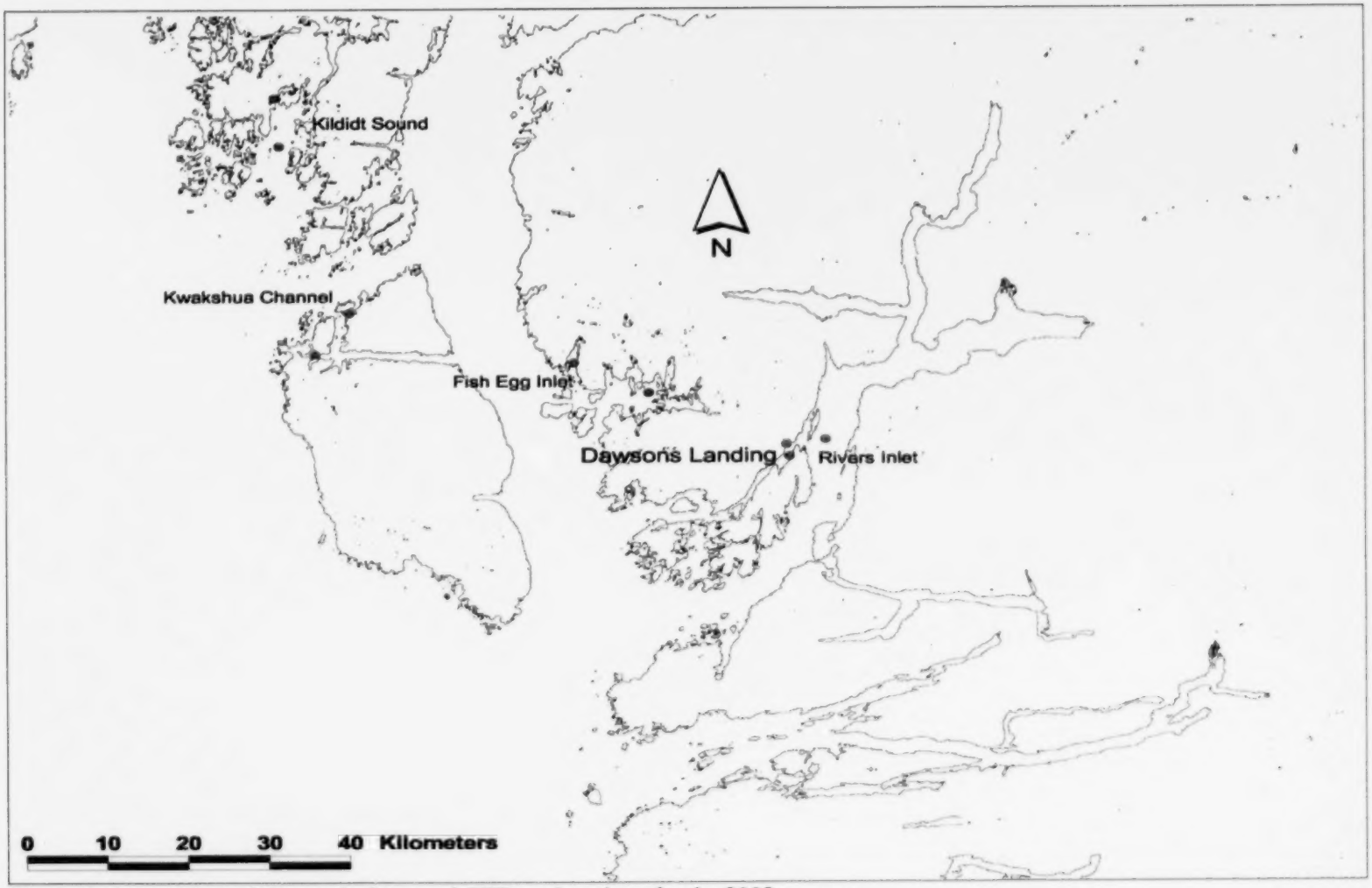


Figure 5. Lower Central Coast plankton and CTD set locations for the 2008 survey.

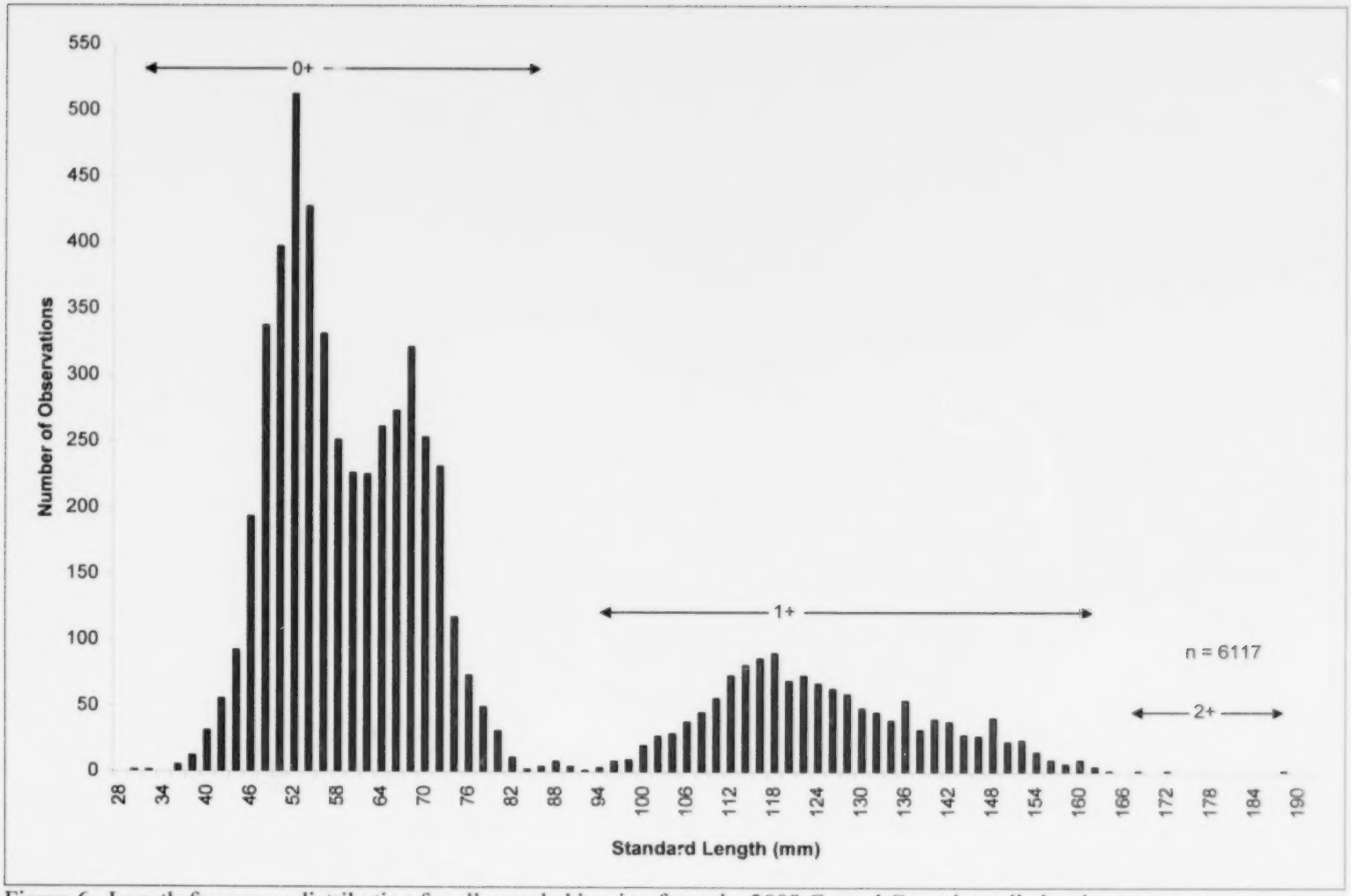
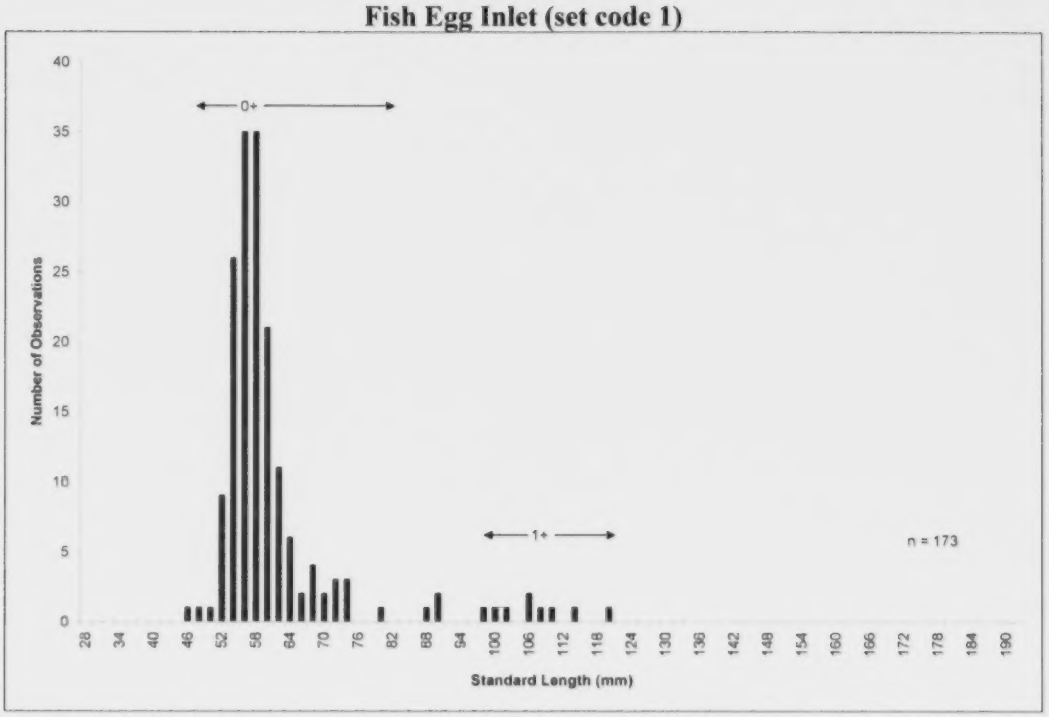


Figure 6. Length-frequency distribution for all sampled herring from the 2008 Central Coast juvenile herring survey.



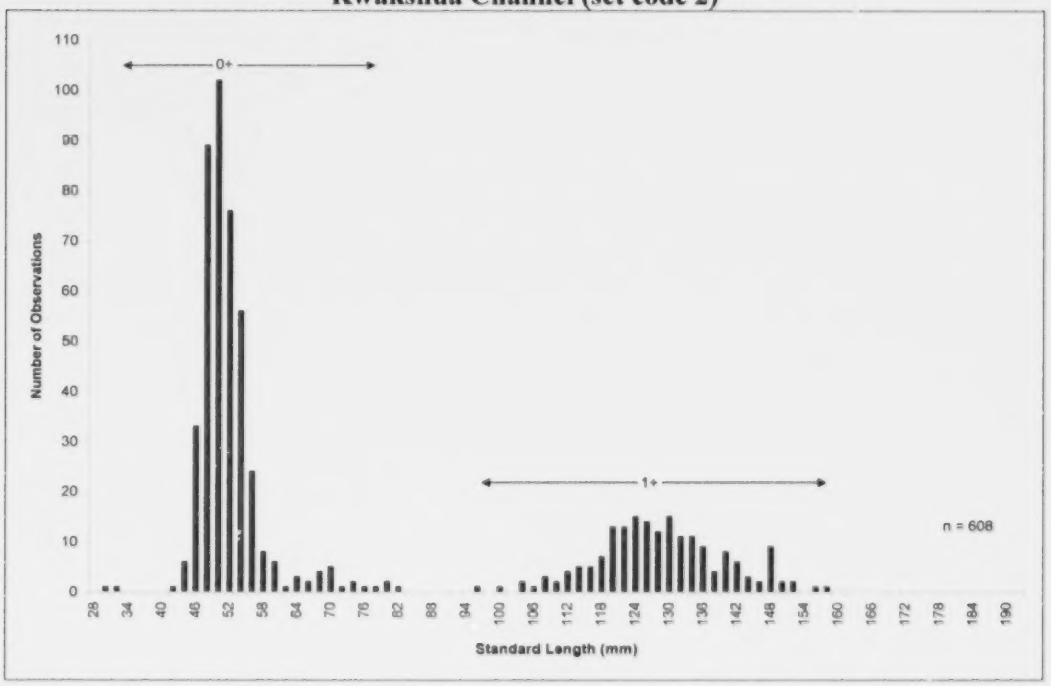
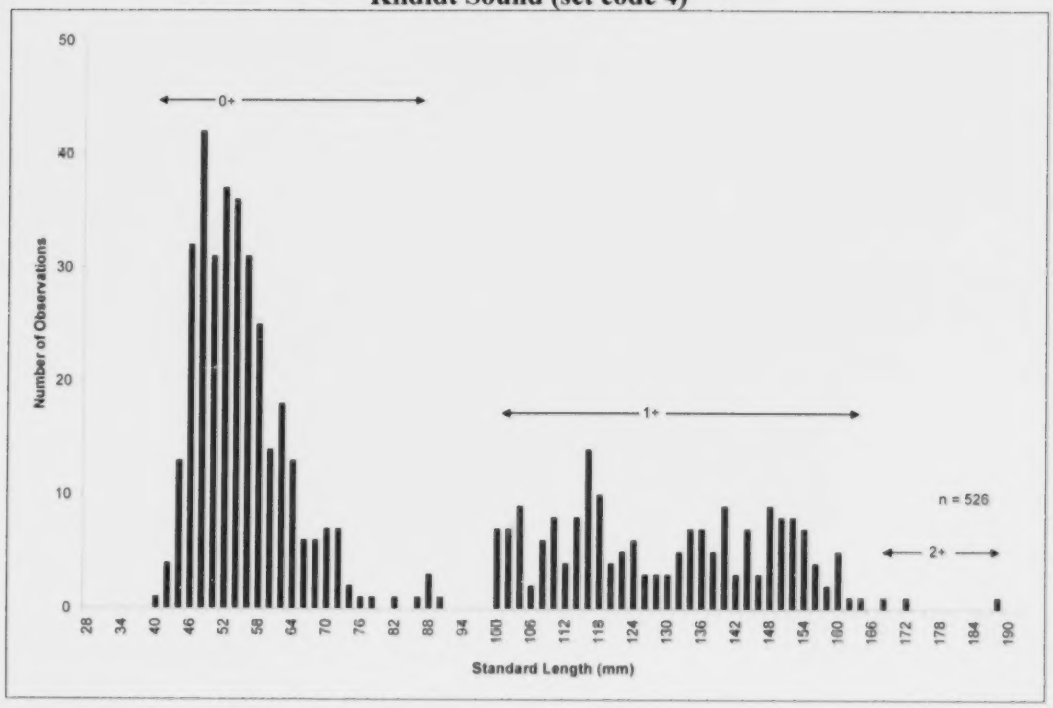


Figure 7. Length-frequency histograms by location (set code) for the 2008 Central Coast juvenile herring survey.

Kildidt Sound (set code 4)



Meyers Pass (set code 6)

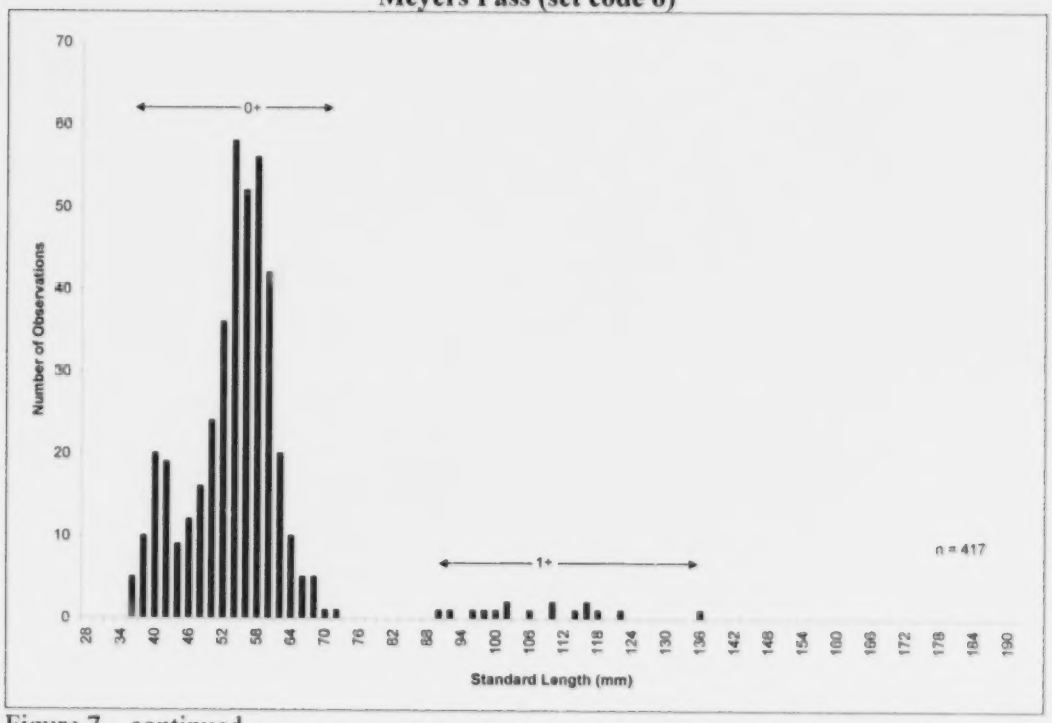
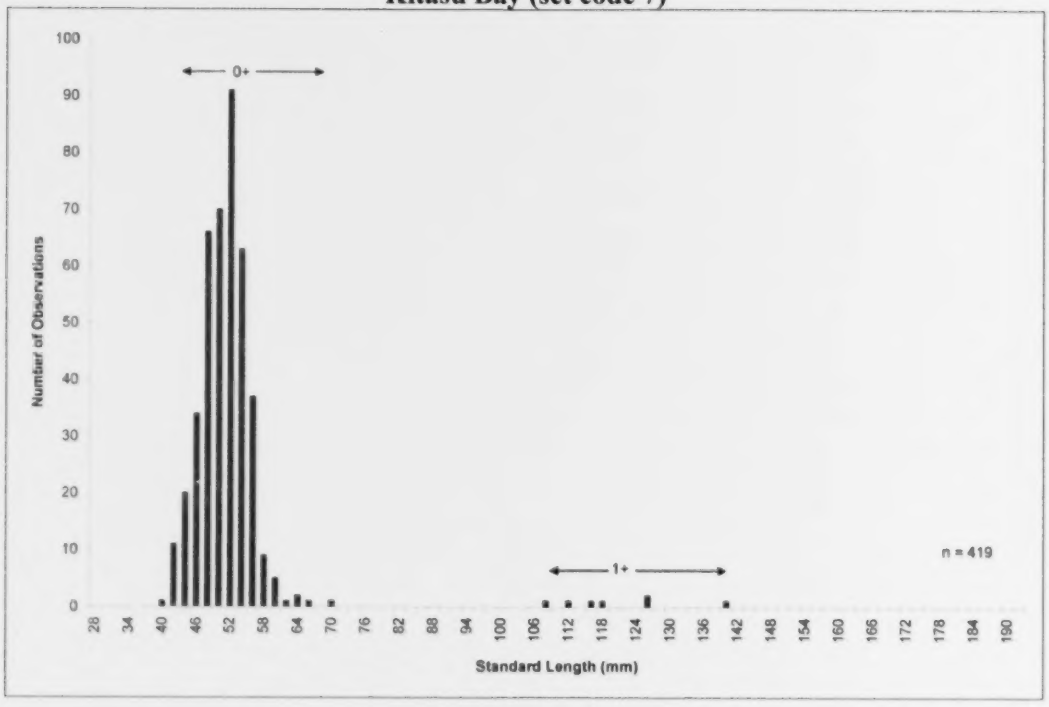


Figure 7…continued

Kitasu Bay (set code 7)



East Higgins Pass (set code 8)

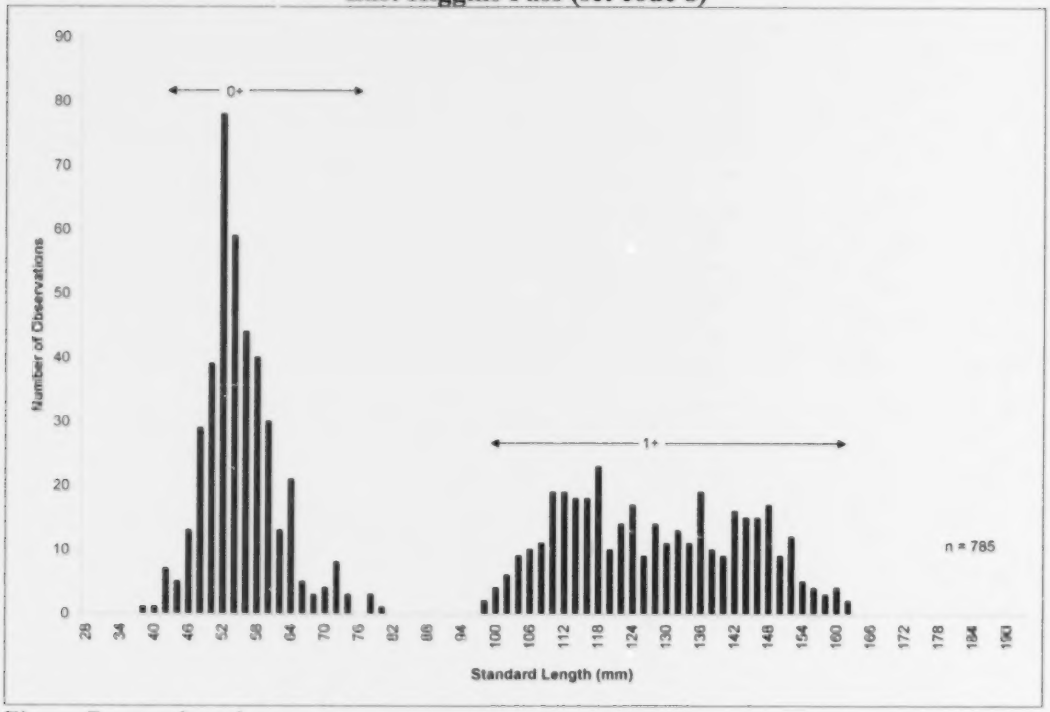
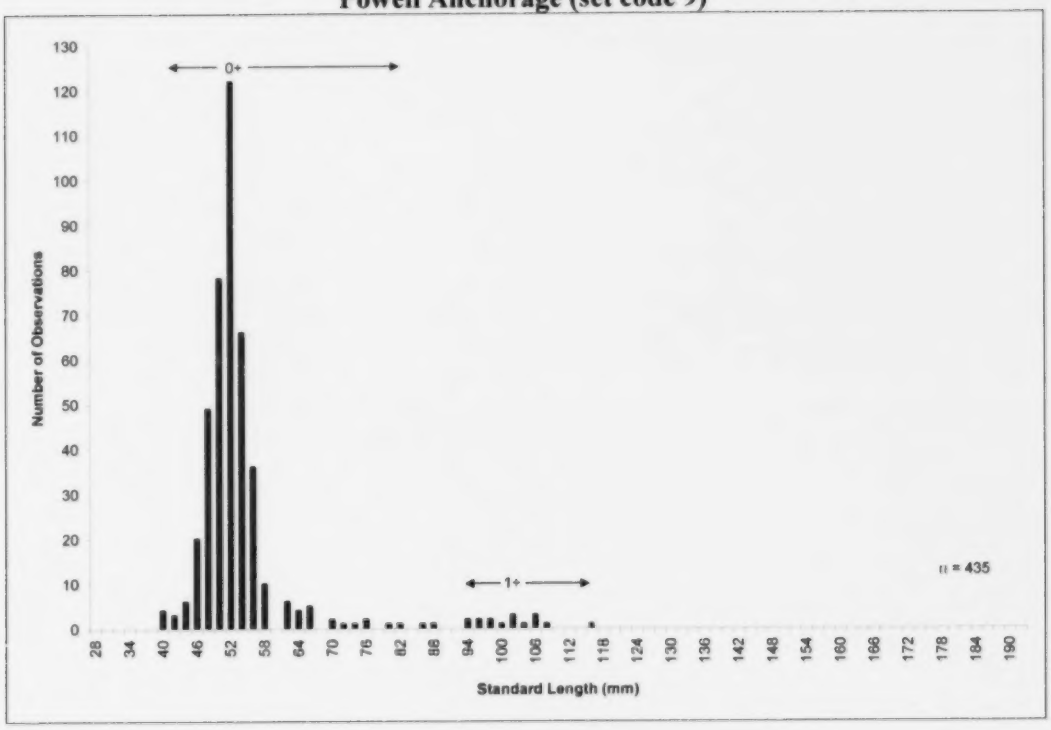


Figure 7…continued

Powell Anchorage (set code 9)



Spiller Channel (set code 10)

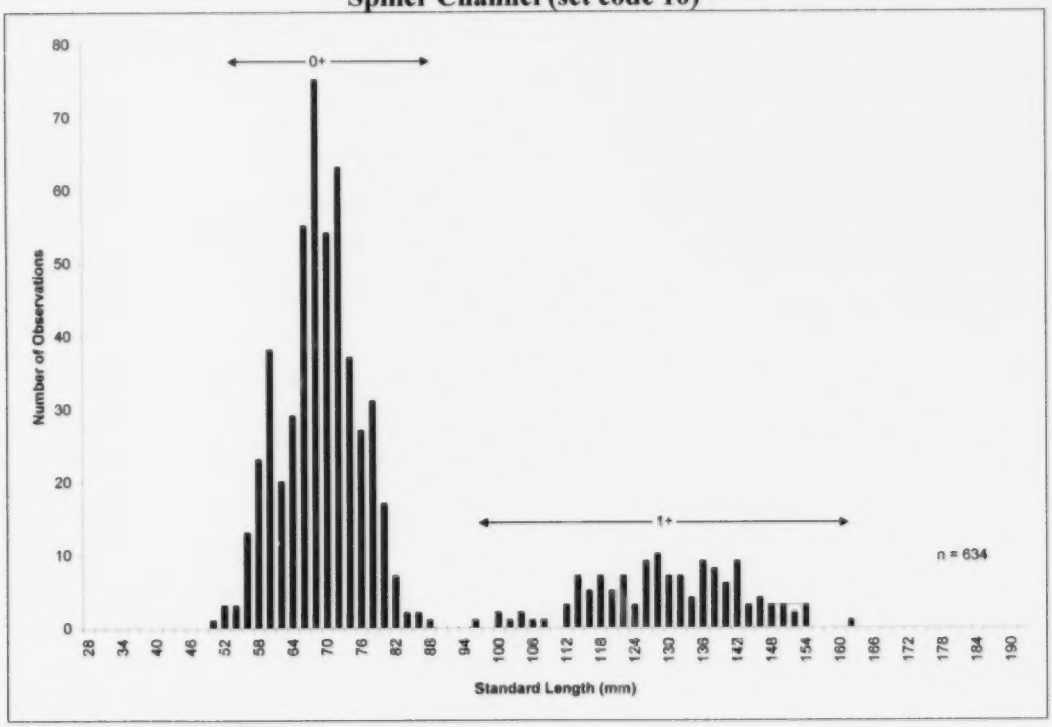
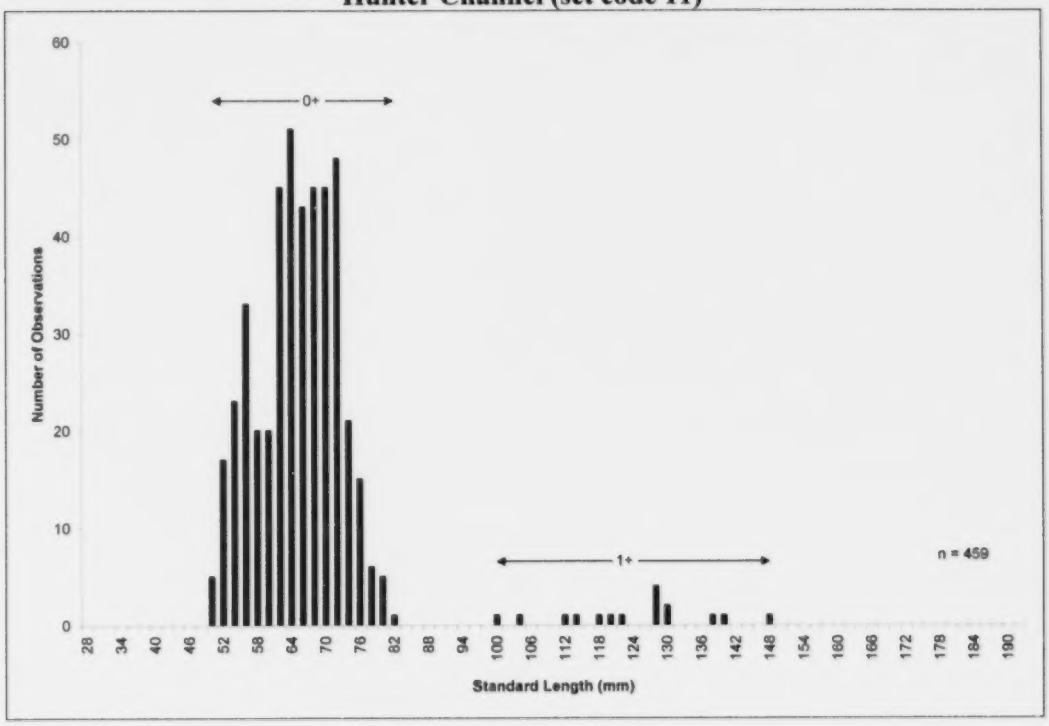


Figure 7…continued

Hunter Channel (set code 11)



Burke Channel (set code 12)

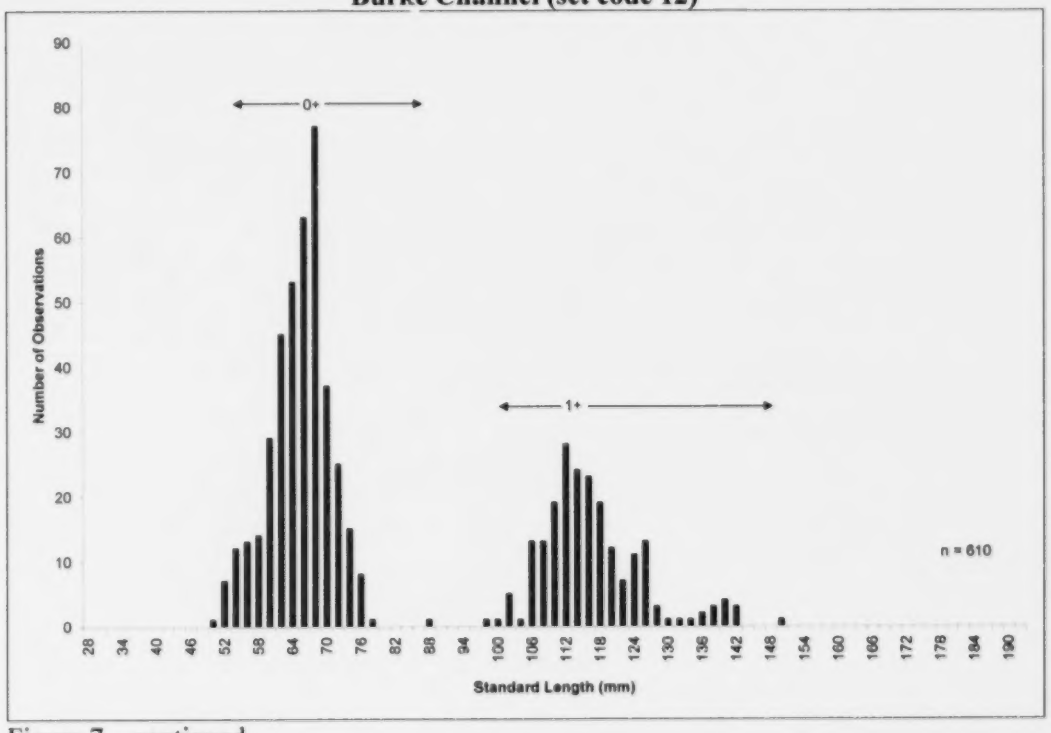
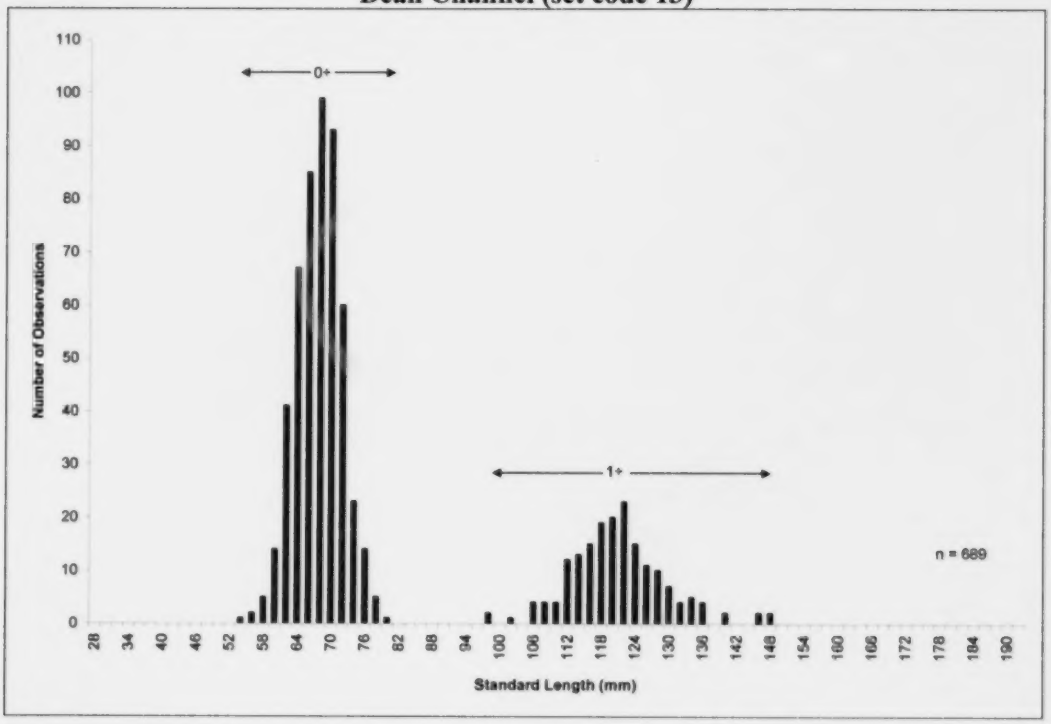


Figure 7…continued

Dean Channel (set code 13)



Rivers Inlet (set code 14)

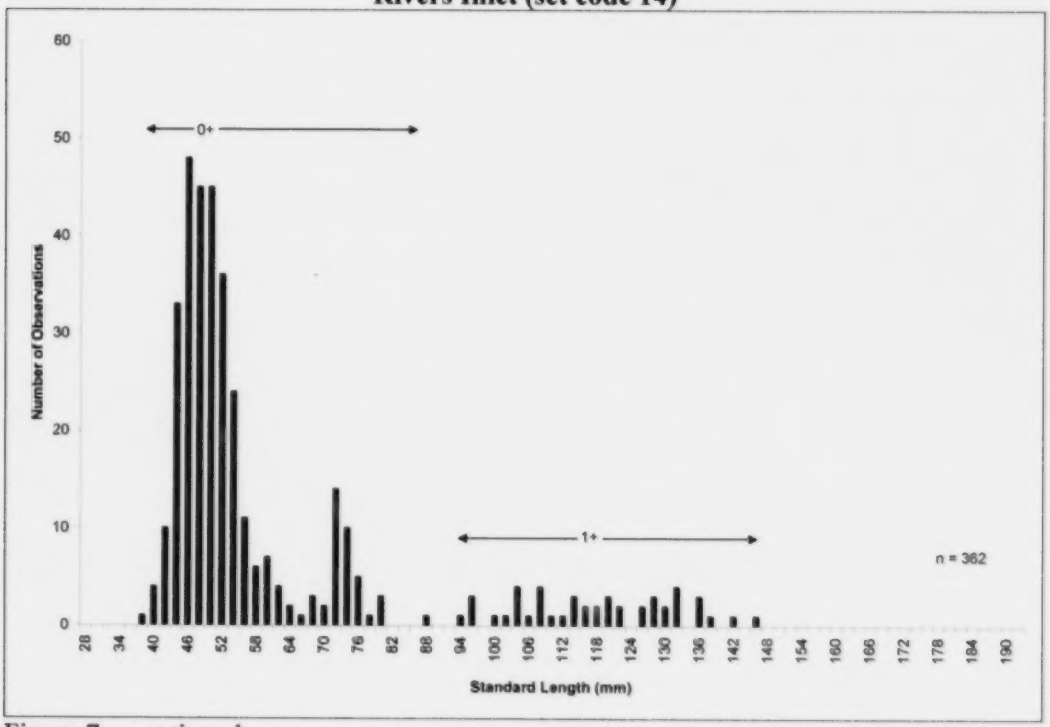


Figure 7…continued

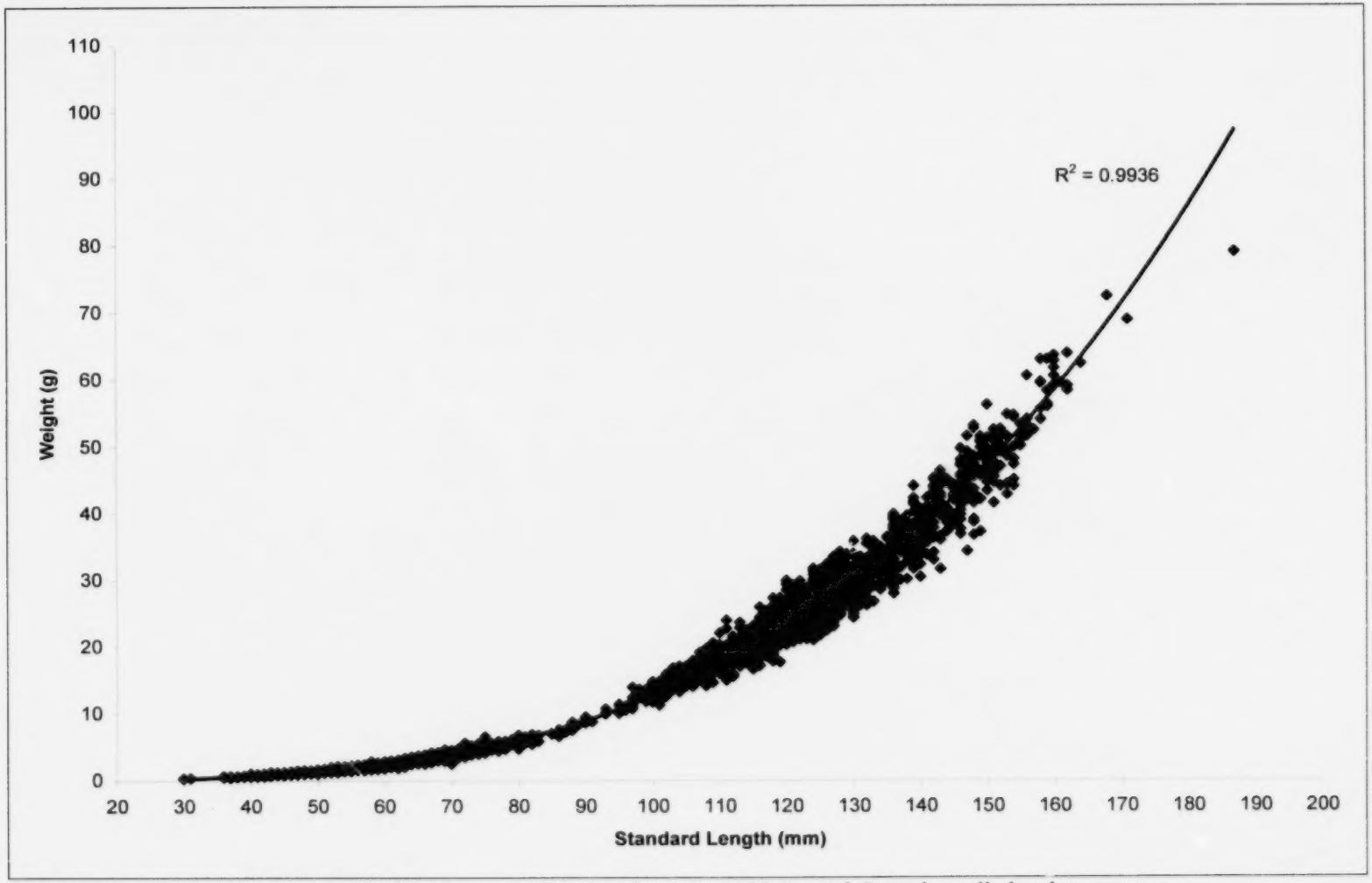


Figure 8. Length-weight relationship for all sampled herring from the 2008 Central Coast juvenile herring survey.

Fish Egg Inlet (set code 1)

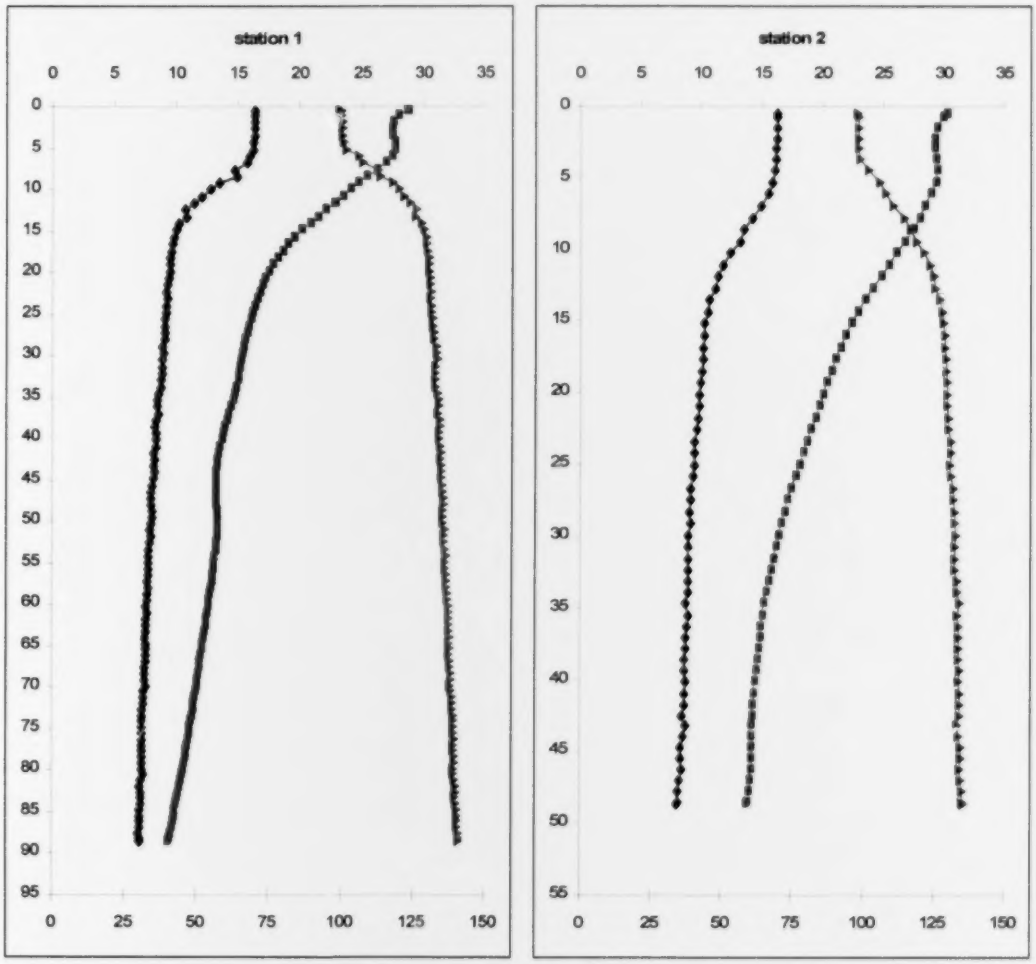
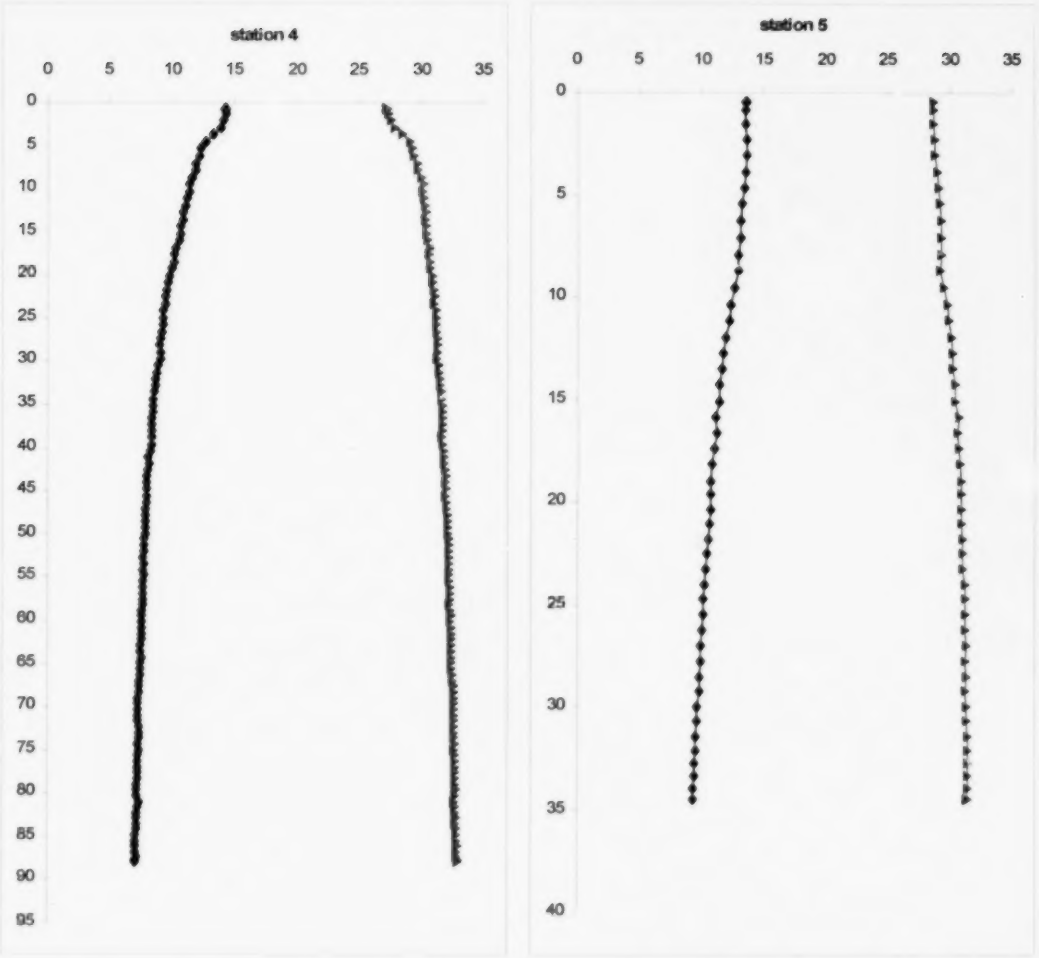


Figure 9. Temperature, salinity and dissolved oxygen profiles from CTD casts during the 2008 Central Coast juvenile herring survey.

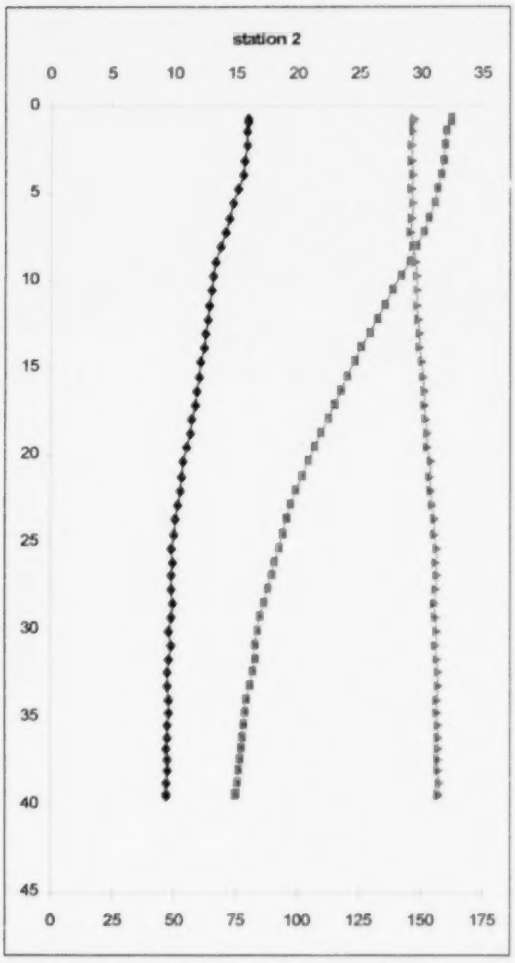
Kwakshua Channel (set code 2)*



* error with dissolved oxygen reading (data excluded).

Figure 9 continued…

Kildidt Sound (set code 4)*



* error with depth reading for station 3 (data unavailable).

Figure 9 continued…

Thompson Bay (set code 5)

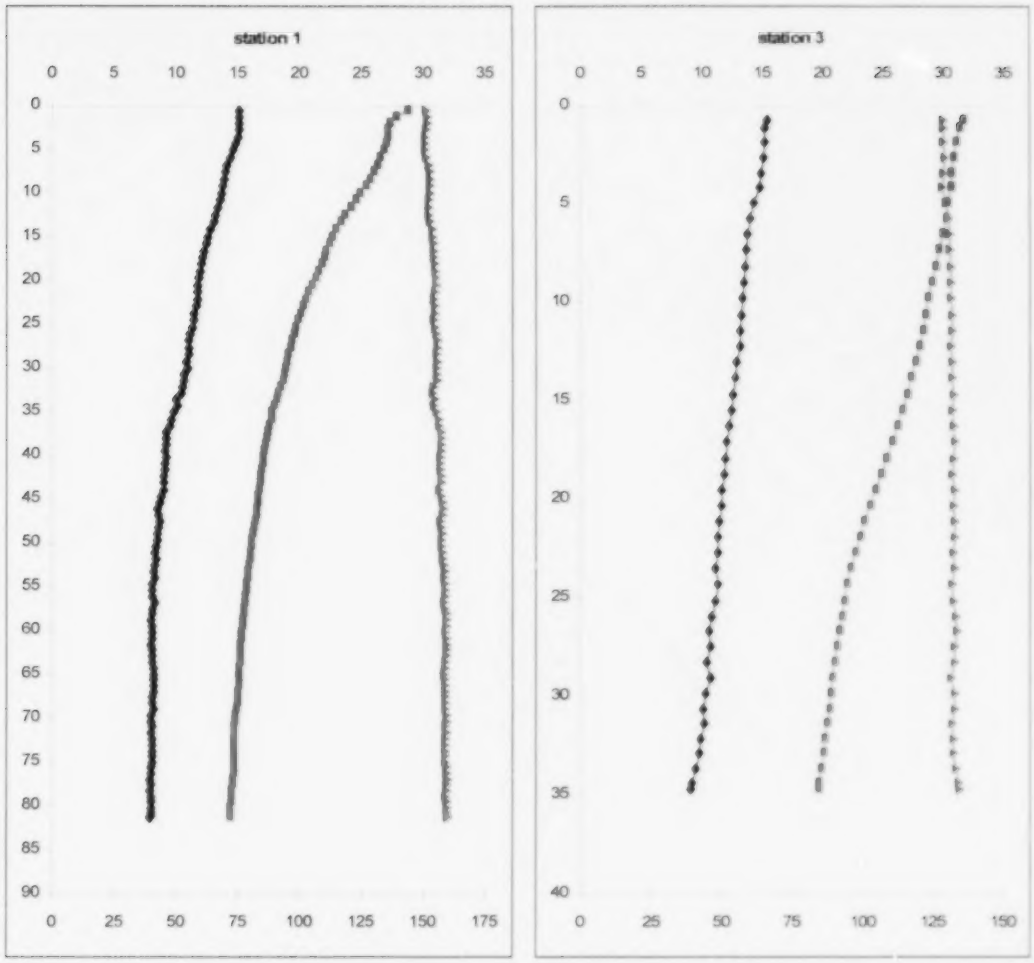


Figure 9 continued…

Meyers Passage (set code 6)

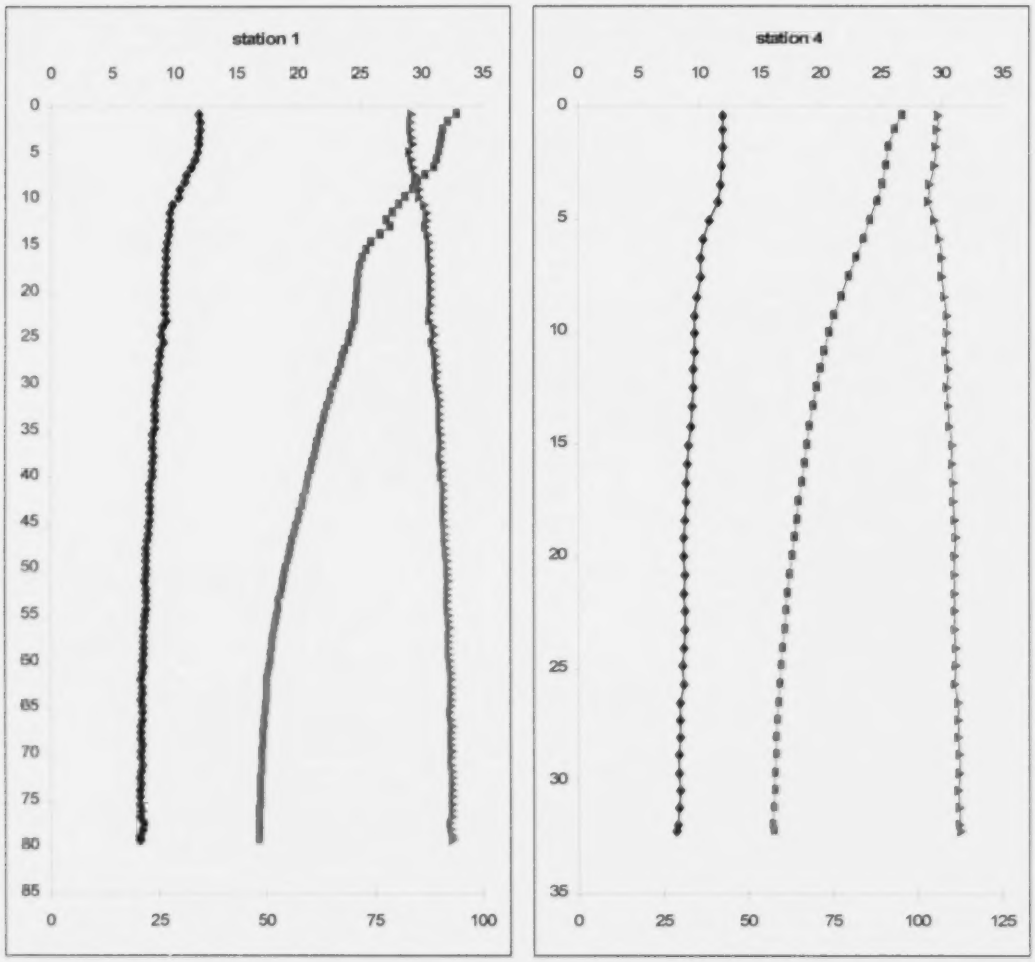


Figure 9 continued…

Kitasu Bay (set code 7)

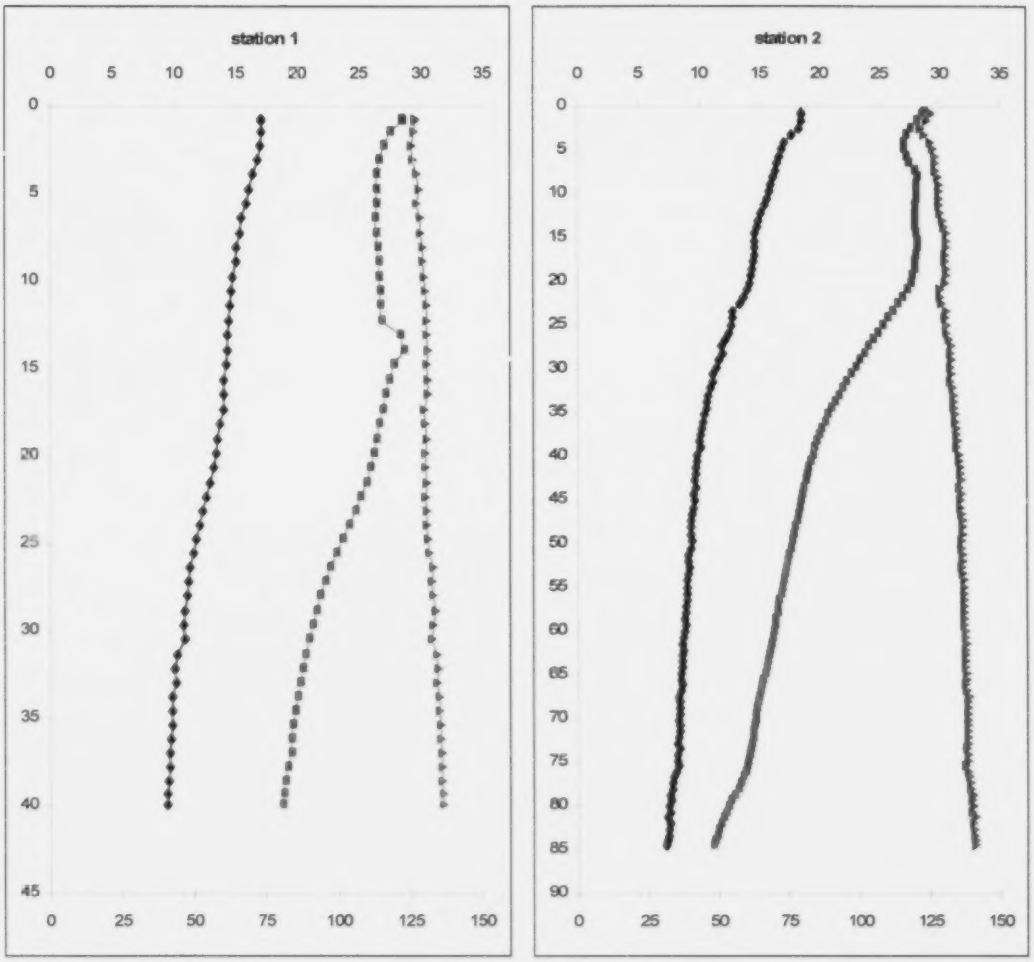


Figure 9 continued…

East Higgins Pass (set code 8)

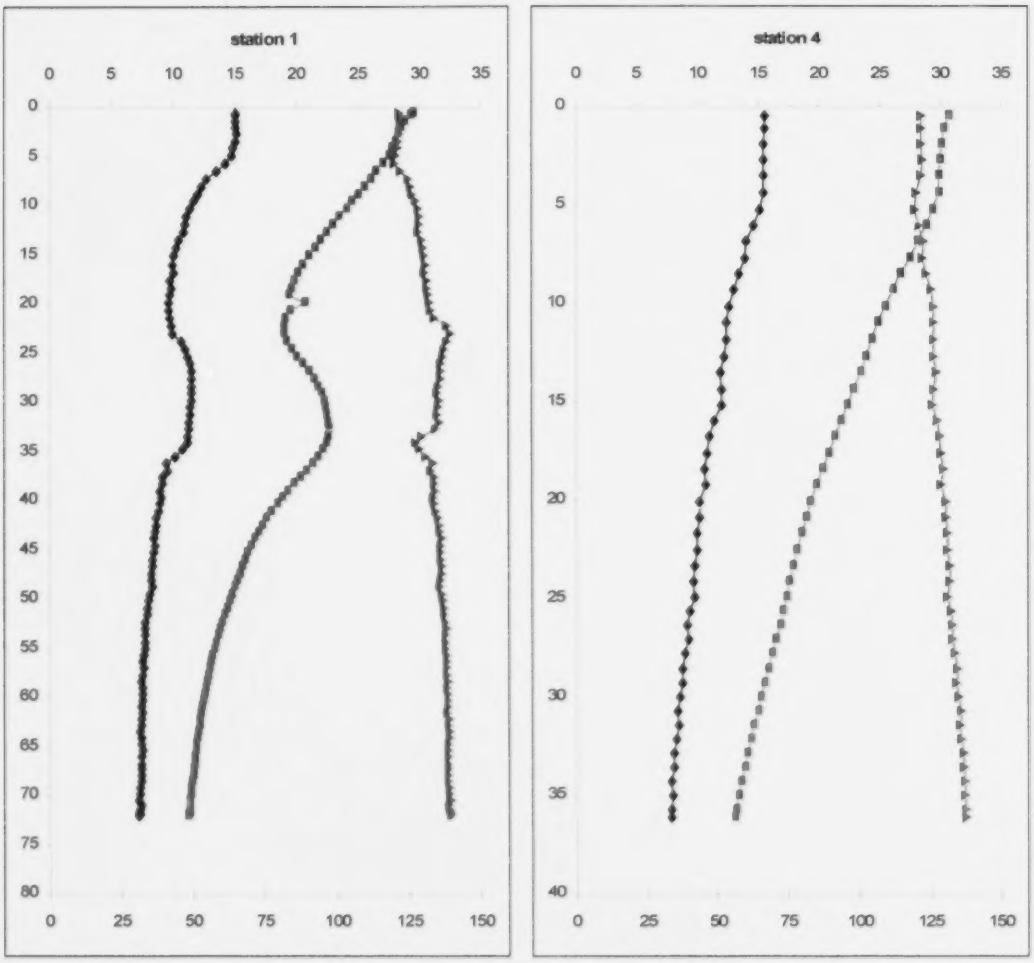


Figure 9 continued…

Powell Anchorage (set code 9)

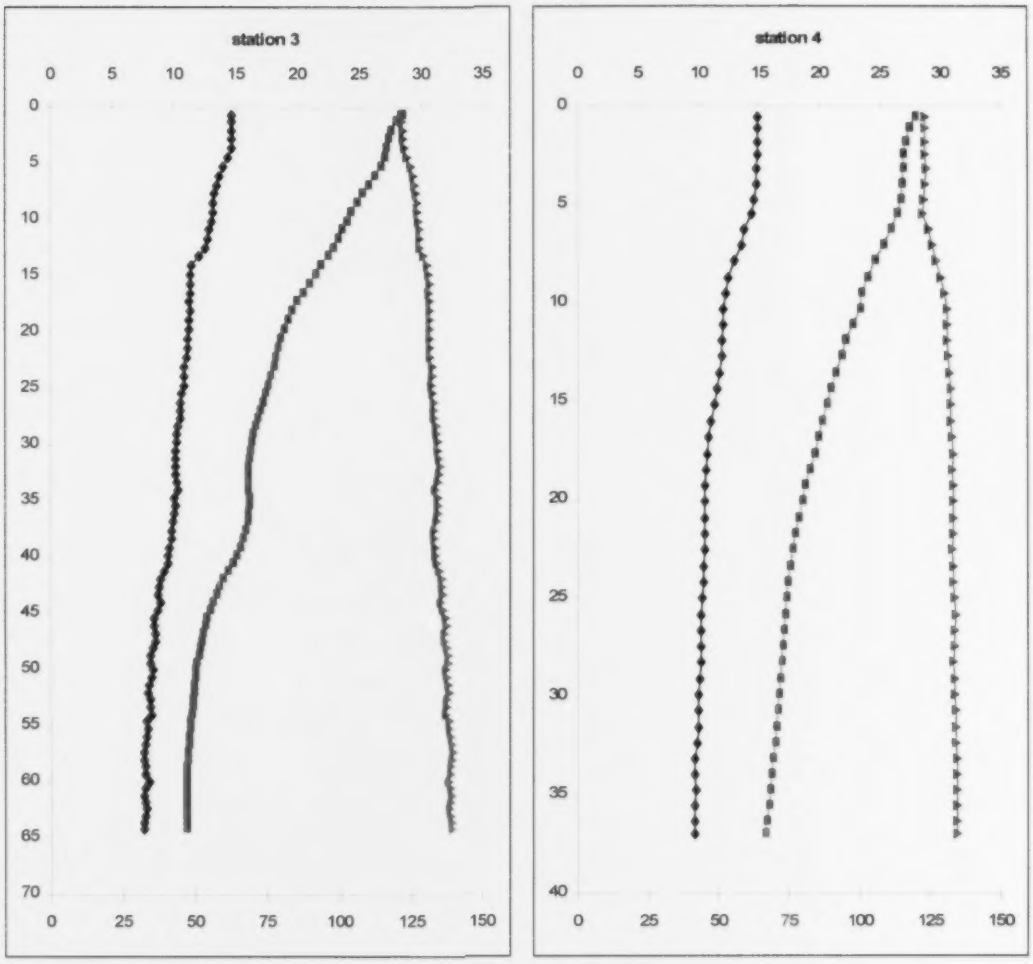


Figure 9 continued…

Spiller Channel (set code 10)

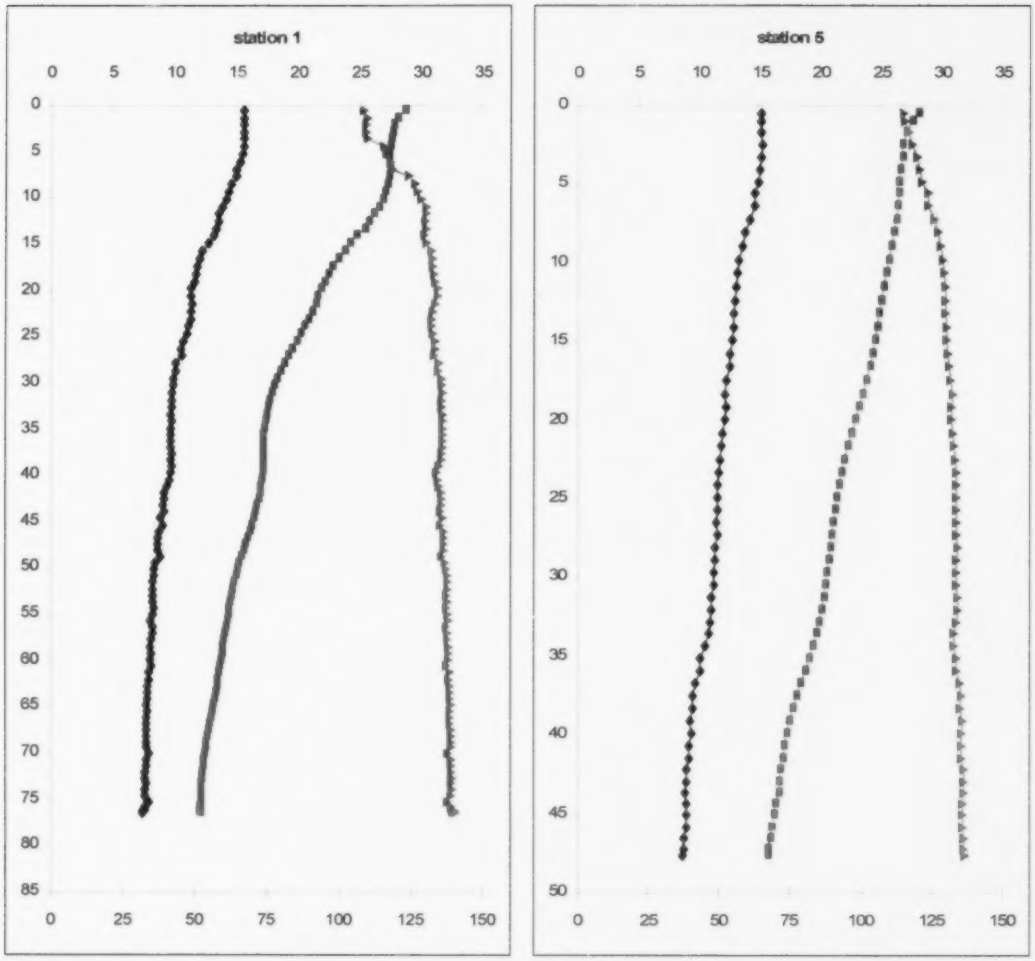


Figure 9 continued…

Hunter Channel (set code 11)

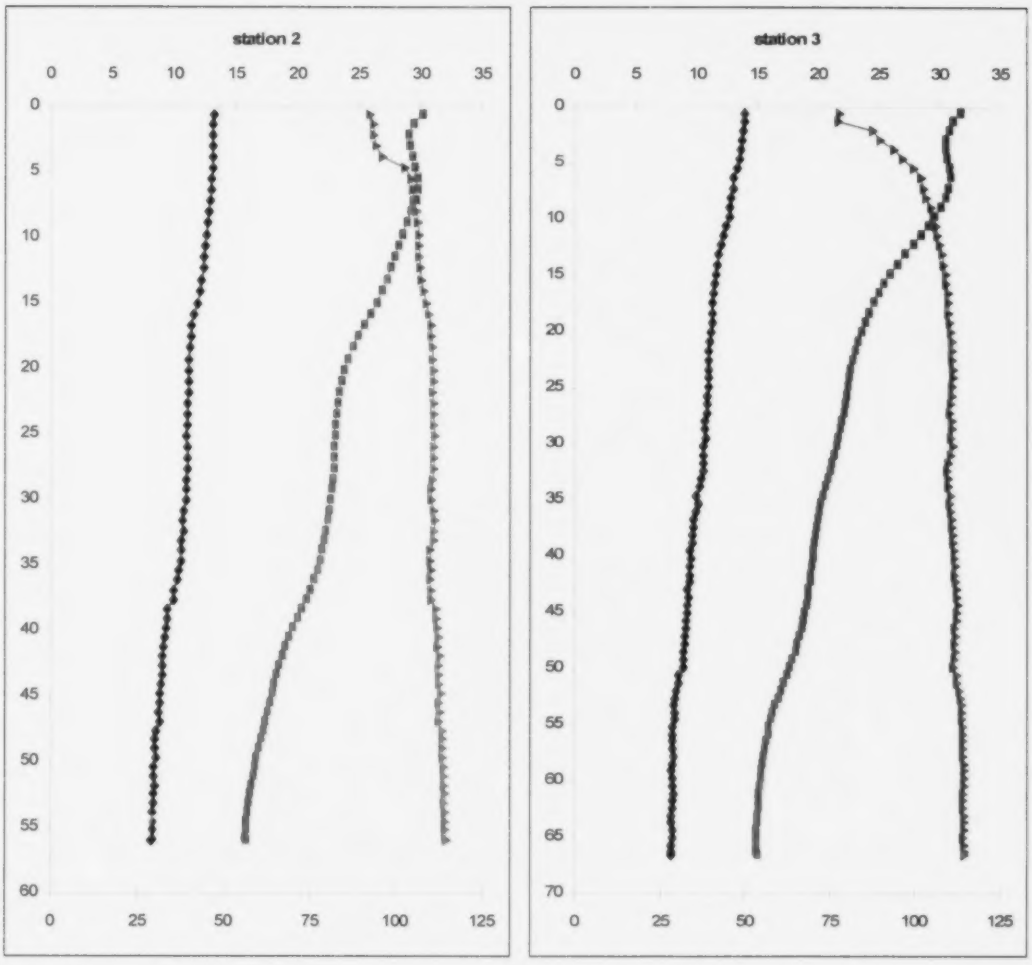


Figure 9 continued…

Burke Channel (set code 12)

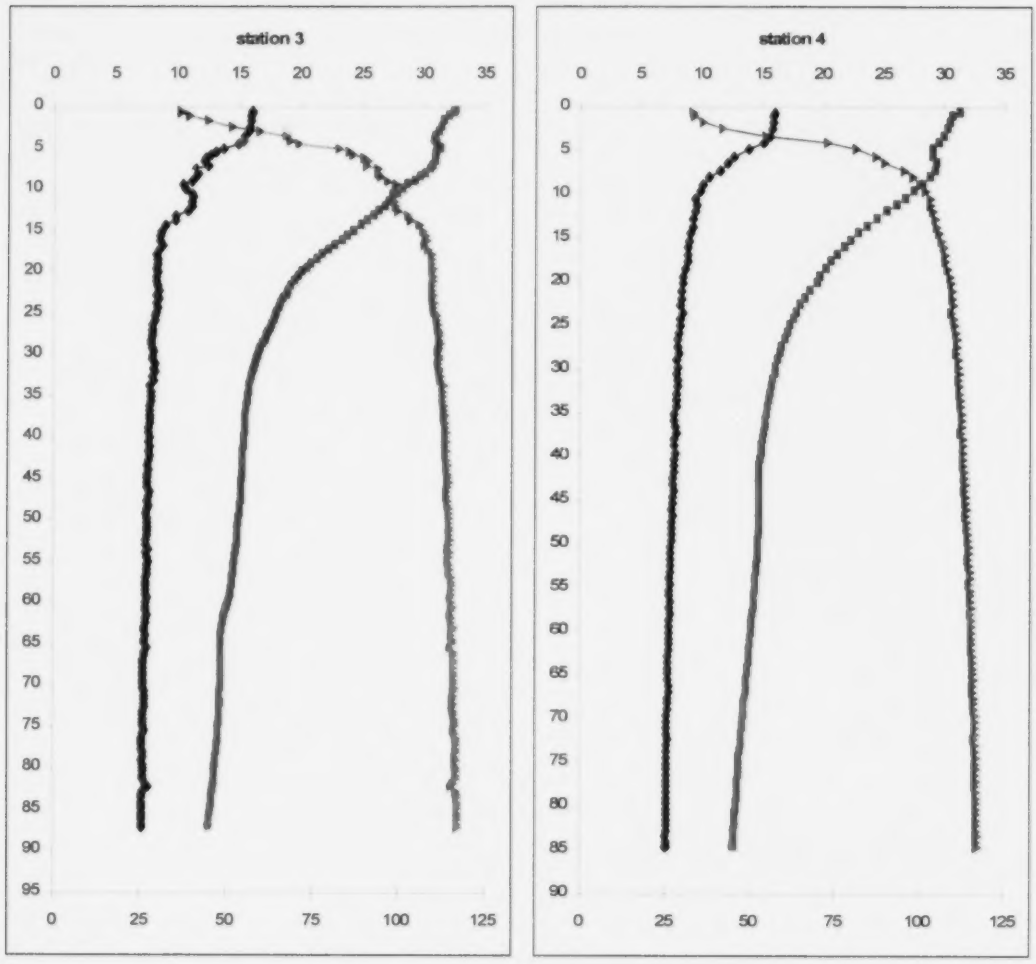


Figure 9 continued…

Dean Channel (set code 13)

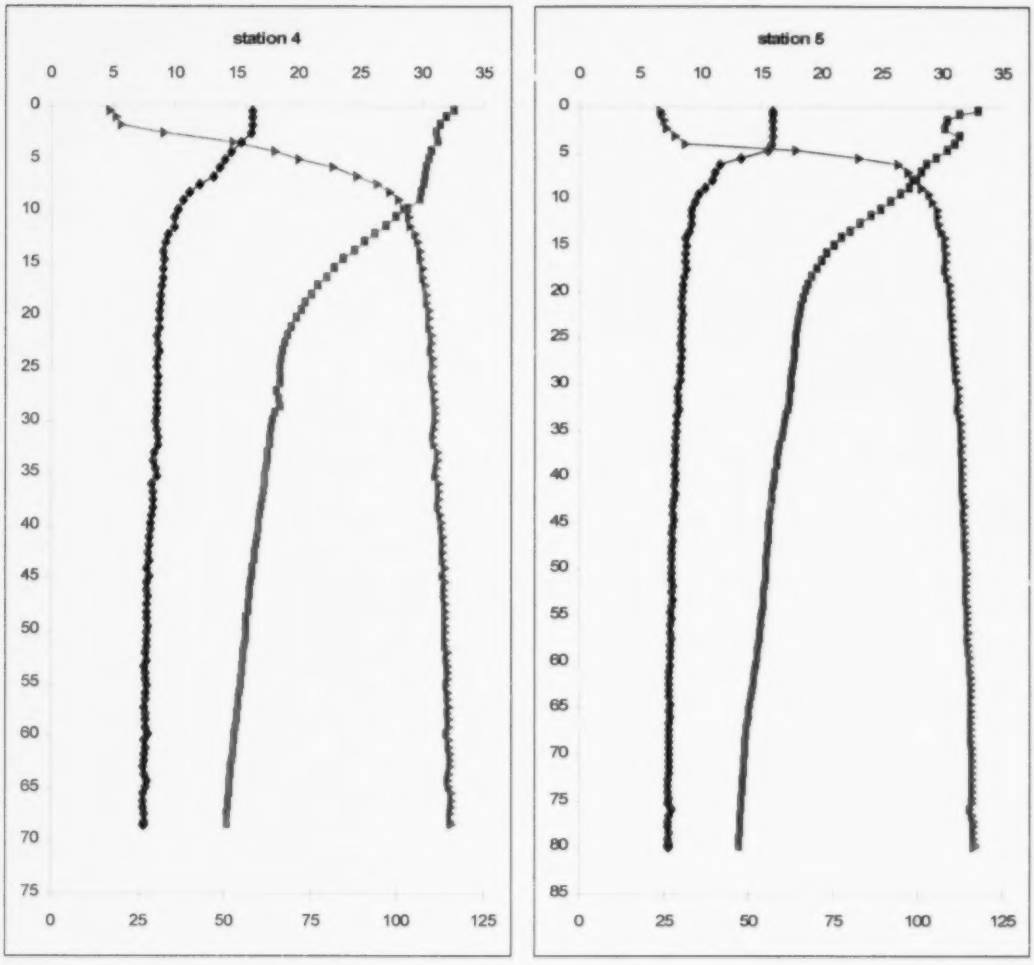


Figure 9 continued…

Rivers Inlet (set code 14)

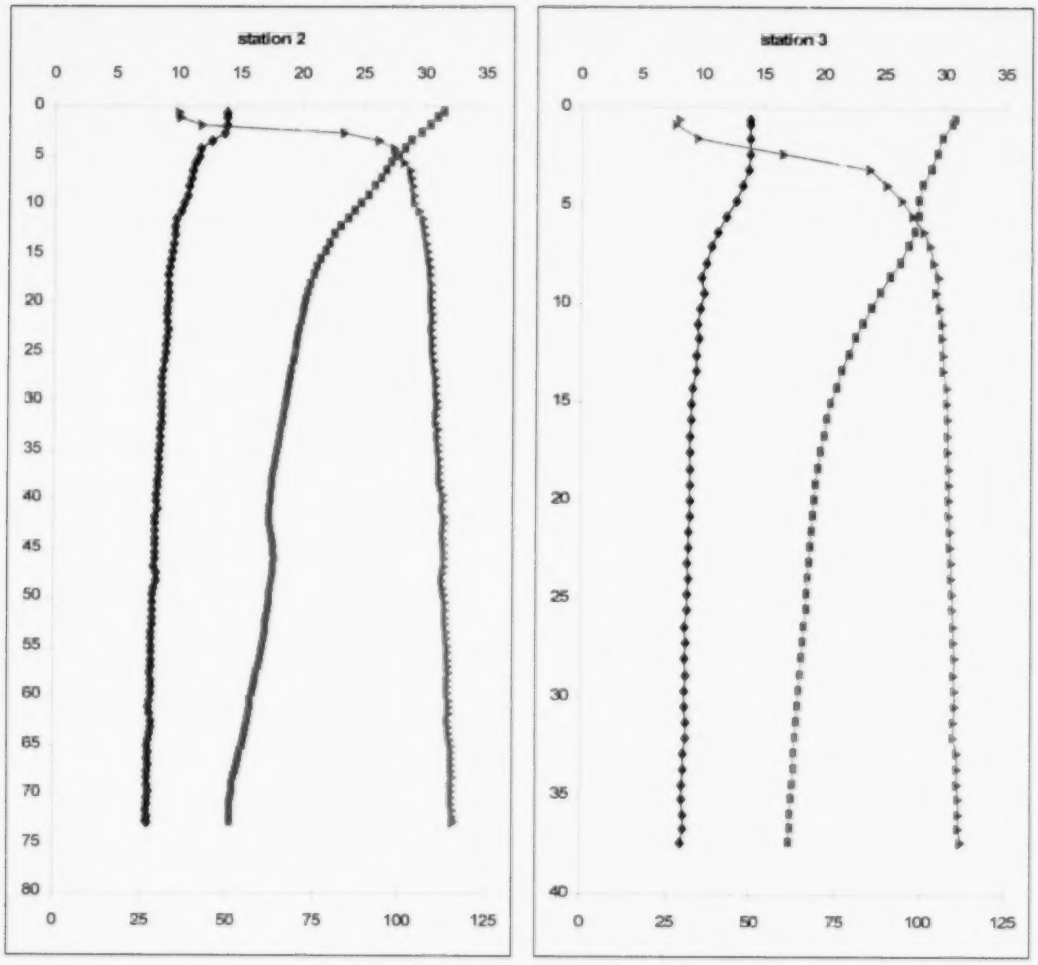


Figure 9 continued…

Table 1. Summary of the purse seine set locations from the 2008 Central Coast juvenile herring survey.

Set	Year	Month	Set Day	Location	Set Code	Station	Set Start Time	DD Lat (N)	DD Long (W)
1	2008	8	10	Kwakshua Channel	2	4	2210	51.655	128.115
2	2008	8	10	Kwakshua Channel	2	3	2245	51.648	128.091
3	2008	8	10	Kwakshua Channel	2	2	2318	51.655	128.053
4	2008	8	10	Kwakshua Channel	2	1	2355	51.676	128.088
5	2008	8	10	Kwakshua Channel	2	5	2425	51.691	128.077
6	2008	8	11	Kildidt Sound	4	3	2200	51.837	128.154
7	2008	8	11	Kildidt Sound	4	4	2230	51.850	128.116
8	2008	8	11	Kildidt Sound	4	1	2305	51.862	128.146
9	2008	8	11	Kildidt Sound	4	5	2335	51.873	128.132
10	2008	8	11	Kildidt Sound	4	2	2410	51.879	128.159
11	2008	8	12	Burke Channel	12	4	2155	52.172	127.573
12	2008	8	12	Burke Channel	12	6	2225	52.182	127.532
13	2008	8	12	Burke Channel	12	3	2300	52.169	127.495
14	2008	8	12	Burke Channel	12	2	2345	52.124	127.438
15	2008	8	12	Burke Channel	12	5	2420	52.105	127.403
16	2008	8	13	Dean Channel	13	5	2210	52.330	127.535
17	2008	8	13	Dean Channel	13	4	2235	52.314	127.540
18	2008	8	13	Dean Channel	13	3	2305	52.300	127.553
19	2008	8	13	Dean Channel	13	2	2335	52.306	127.582
20	2008	8	13	Dean Channel	13	1	2400	52.306	127.582
21	2008	8	15	East Higgins Pass	8	1	2200	52.402	128.558
22	2008	8	15	East Higgins Pass	8	2	2245	52.436	128.595
23	2008	8	15	East Higgins Pass	8	3	2325	52.471	128.638
24	2008	8	15	East Higgins Pass	8	5	2355	52.492	128.661
25	2008	8	15	East Higgins Pass	8	4	2425	52.492	128.693
26	2008	8	16	Kitasu Bay	7	1	2200	52.550	128.800
27	2008	8	16	Kitasu Bay	7	2	2225	52.545	128.771
28	2008	8	16	Kitasu Bay	7	5	2250	52.555	128.751
29	2008	8	16	Kitasu Bay	7	3	2315	52.541	128.742
30	2008	8	16	Kitasu Bay	7	4	2345	52.525	128.751
31	2008	8	17	Meyers Passage	6	4	2200	52.655	128.576
32	2008	8	17	Meyers Passage	6	3	2225	52.665	128.562
33	2008	8	17	Meyers Passage	6	1	2245	52.673	128.572
34	2008	8	17	Meyers Passage	6	2	2315	52.684	128.577
35	2008	8	17	Meyers Passage	6	5	2345	52.673	128.599
36	2008	8	18	Powell Anchorage	9	3	2145	52.321	128.378
37	2008	8	18	Powell Anchorage	9	4	2215	52.326	128.344
38	2008	8	18	Powell Anchorage	9	5	2240	52.312	128.359
39	2008	8	18	Powell Anchorage	9	2	2310	52.284	128.355
40	2008	8	18	Powell Anchorage	9	1	2340	52.291	128.376

Table 1 continued…

Set	Year	Month	Set Day	Location	Set Code	Station	Set Start Time	DD Lat (N)	DD Long (W)
41	2008	8	19	Spiller Channel	10	5	2130	52.263	128.336
42	2008	8	19	Spiller Channel	10	1	2210	52.250	128.274
43	2008	8	19	Spiller Channel	10	2	2240	52.268	128.271
44	2008	8	19	Spiller Channel	10	4	2320	52.290	128.259
45	2008	8	19	Spiller Channel	10	3	2350	52.277	128.235
46	2008	8	20	Hunter Channel	11	2	2140	52.057	128.141
47	2008	8	20	Hunter Channel	11	5	2205	52.066	128.159
48	2008	8	20	Hunter Channel	11	4	2230	52.078	128.153
49	2008	8	20	Hunter Channel	11	3	2255	52.073	128.135
50	2008	8	20	Hunter Channel	11	1	2325	52.057	128.115
51	2008	8	21	Fish Egg Inlet	1	1	2135	51.621	127.745
52	2008	8	21	Fish Egg Inlet	1	2	2205	51.604	127.773
53	2008	8	21	Fish Egg Inlet	1	5	2235	51.632	127.777
54	2008	8	21	Fish Egg Inlet	1	3	2310	51.617	127.832
55	2008	8	21	Fish Egg Inlet	1	4	2345	51.647	127.828
56	2008	8	22	Rivers Inlet	14	3	2125	51.592	127.568
57	2008	8	22	Rivers Inlet	14	5	2200	51.565	127.589
58	2008	8	22	Rivers Inlet	14	4	2225	51.572	127.575
59	2008	8	22	Rivers Inlet	14	2	2250	51.580	127.549

Table 2. Summary of the number and weight by species, transect, and station from the 2008 Central Coast juvenile herring survey.

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
1	2	4	Kwakshua Channel	**Pacific herring age-0+**	18908	28.93
				Pacific herring age-1+	31	1.21
				Pink salmon	1	1.50
2	2	3	Kwakshua Channel	**Pacific herring age-0+**	20119	21.33
				Pacific herring age-1+	1259	34.58
				Juvenile walleye pollock	273	1.15
				Pile perch	12	0.58
3	2	2	Kwakshua Channel	**Pacific herring age-0+**	26	0.08
				Pacific herring age-1+	10	0.18
				Lingcod	4	0.04
				Juvenile rockfish	2	trace
				Sandlance	18	0.02
				Squid	4	0.05
4	2	1	Kwakshua Channel	**Pacific herring age-0+**	3536	4.63
				Pacific herring age-1+	368	11.91
				Sandlance	13	0.02
				Squid	4	0.03
5	2	5	Kwakshua Channel	**Pacific herring age-0+**	20813	27.26
				Capelin	768	0.62
				Juvenile walleye pollock	62	0.43
				Sandlance	75	0.09
6	4	3	Kildidt Sound	**Pacific herring age-0+**	19	0.05
				Pacific herring age-1+	151	5.89
				Pacific herring age-2+	4	0.28
				Juvenile walleye pollock	1552	7.42
				Juvenile rockfish	3	0.01
				Capelin	1	trace
7	4	4	Kildidt Sound	**Pacific herring age-0+**	418	0.60
				Juvenile rockfish	25	0.06
				Juvenile walleye pollock	9	0.04
				Capelin	3	trace
				Three-spine stickleback	3	trace
				Juvenile sablefish	1	trace
				Pacific sardine	1	0.13

* Weights ≤ 9g referred to as trace

Table 2 continued…

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
8	4	1	Kildidt Sound	**Pacific herring age-0+**	8	0.02
				Pacific herring age-1+	22	0.52
				Juvenile rockfish	27	0.06
				Juvenile walleye pollock	2	0.01
9	4	5	Kildidt Sound	**Pacific herring age-0+**	360	0.77
				Pacific herring age-1+	122	2.46
				Juvenile rockfish	14	0.04
				Juvenile walleye pollock	12	0.05
				Sandlance	4	0.01
				Squid	1202	16.45
10	4	2	Kildidt Sound	**Pacific herring age-0+**	1243	2.19
				Pacific herring age-1+	10	0.17
				Juvenile rockfish	121	0.70
				Lingcod	1	0.01
				Sculpin	1	trace
				Shiner perch	1	0.01
				Squid	3	0.13
11	12	4	Burke Channel	**Pacific herring age-0+**	6252	22.01
				Pacific herring age-1+	77	2.45
				Coho salmon	6	0.02
12	12	6	Burke Channel	**Pacific herring age-0+**	7056	22.10
				Pacific herring age-1+	1188	22.63
13	12	3	Burke Channel	**Pacific herring age-0+**	1812	6.23
				Pacific herring age-1+	8	0.25
				Capelin	120	0.10
				Three-spine stickleback	40	0.07
14	12	2	Burke Channel	**Pacific herring age-0+**	9698	28.52
				Pacific herring age-1+	13	0.27
				Three-spine stickleback	169	0.19
				Capelin	39	0.02
				Sandlance	13	0.02
15	12	5	Burke Channel	**Pacific herring age-0+**	9	0.07
				Pacific herring age-1+	1593	35.80
				Sandlance	72	0.08
				Chum salmon	2	10.00

Table 2 continued…

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
16	13	5	Dean Channel	**Pacific herring age-0+**	2898	10.63
				Pacific herring age-1+	138	3.47
				Capelin	30	0.04
				Juvenile walleye pollock	18	0.10
				Pacific sardine	6	1.15
17	13	4	Dean Channel	**Pacific herring age-0+**	101	0.40
				Pacific herring age-1+	26	0.66
				Three-spine stickleback	11	0.03
				Coho salmon	4	0.09
				Juvenile walleye pollock	4	0.02
				Capelin	1	trace
18	13	3	Dean Channel	**Pacific herring age-0+**	275	0.85
				Pacific herring age-1+	13	0.34
				Juvenile walleye pollock	23	0.13
				Capelin	5	0.01
				Three-spine stickleback	4	0.01
				Pacific sardine	3	0.58
				Northern anchovy	2	0.05
19	13	2	Dean Channel	**Pacific herring age-0+**	109	0.41
				Pacific herring age-1+	73	1.80
				Juvenile walleye pollock	144	0.84
				Three-spine stickleback	12	0.01
				Capelin	7	0.01
				Chum salmon	2	0.02
				Northern anchovy	1	0.02
20	13	1	Dean Channel	**Pacific herring age-0+**	2370	7.59
				Pacific herring age-1+	220	5.91
				Juvenile walleye pollock	25	0.14
				Pacific sardine	10	1.73
				Three-spine stickleback	10	0.01
				Chinook salmon	5	0.25
21	8	1	East Higgins Pass	**Pacific herring age-0+**	21	0.06
				Pacific herring age-1+	477	17.81
				Pacific sardine	9	1.41
				Northern anchovy	3	0.07

Table 2 continued...

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
22	8	2	East Higgins Pass	**Pacific herring age-0+**	12740	30.70
				Pacific herring age-1+	234	8.33
				Pacific sardine	702	121.93
23	8	3	East Higgins Pass	**Pacific herring age-0+**	26877	44.62
				Pacific herring age-1+	1343	46.41
				Pacific sardine	34	5.39
				Coho salmon	1	3.00
24	8	5	East Higgins Pass	**Pacific herring age-0+**	1005	1.55
				Pacific herring age-1+	1335	32.38
				Pacific sardine	20	3.39
				Juvenile rockfish	15	0.04
				Eulachon	5	0.02
				Juvenile walleye pollock	5	0.06
25	8	4	East Higgins Pass	**Pacific herring age-0+**	549	0.80
				Pacific herring age-1+	81	1.47
				Capelin	1157	1.20
				Juvenile rockfish	16	0.05
				Chinook salmon	1	0.17
				Squid	1	0.03
26	7	1	Kitasu Bay	**Pacific herring age-0+**	3249	3.74
				Juvenile rockfish	9	0.25
				Chinook salmon	3	0.24
				Squid	33	0.43
27	7	2	Kitasu Bay	**Pacific herring age-0+**	2355	3.72
				Pacific herring age-1+	12	0.31
28	7	5	Kitasu Bay	**Pacific herring age-0+**	15584	23.38
				Pacific herring age-1+	48	1.12
				Pacific sardine	1040	160.16
				Juvenile rockfish	160	0.50
29	7	3	Kitasu Bay	**Pacific herring age-0+**	6146	9.22
				Juvenile rockfish	42	0.11

Table 2 continued…

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
30	7	4	Kitasu Bay	**Pacific herring age-0+**	12	0.02
				Juvenile rockfish	5	0.01
				Pacific sardine	3	0.52
				Chum salmon	1	0.13
				Tubesnout	1	trace
				Squid	1	0.02
31	6	4	Meyers Passage	**Pacific herring age-0+**	11066	19.92
32	6	3	Meyers Passage	**Pacific herring age-0+**	176	0.26
				Pacific herring age-1+	8	0.13
				Juvenile rockfish	36	0.10
				Pacific sardine	12	2.00
				Pink salmon	9	0.07
				Sandlance	5	trace
				Juvenile walleye pollock	2	0.01
33	6	1	Meyers Passage	**Pacific herring age-0+**	1	trace
				Pacific herring age-1+	1	0.03
				Juvenile rockfish	1	trace
34	6	2	Meyers Passage	**Pacific herring age-0+**	626103	1001.76
35	6	5	Meyers Passage	**Pacific herring age-0+**	1139	1.91
				Pacific herring age-1+	5	0.08
				Juvenile walleye pollock	52	0.19
				Sandlance	2	trace
				Three-spine stickleback	2	trace
				Juvenile rockfish	1	trace
36	9	3	Powell Anchorage	**Pacific herring age-0+**	15	0.05
				Pacific herring age-1+	1	0.02
				Chum salmon	1	0.05
				Sandlance	1	trace
37	9	4	Powell Anchorage	**Pacific herring age-0+**	6156	8.49
				Capelin	6	0.05
				Snake prickleback	6	0.01

Table 2 continued…

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
38	9	5	Powell Anchorage	**Pacific herring age-0+**	362	0.57
				Pacific herring age-1+	1	0.01
				Juvenile rockfish	23	0.06
				Lingcod	1	0.01
				Squid	2	0.05
39	9	2	Powell Anchorage	**Pacific herring age-0+**	4352	6.44
40	9	1	Powell Anchorage	**Pacific herring age-0+**	5448	8.23
				Pacific herring age-1+	52	0.66
				Juvenile walleye pollock	16	0.22
41	10	5	Spiller Channel	**Pacific herring age-0+**	5070	20.03
				Sandlance	150	0.29
42	10	1	Spiller Channel	**Pacific herring age-0+**	415	1.87
				Pacific herring age-1+	82	2.63
				Pacific sardine	4	0.65
				Chinook salmon	2	0.27
				Northern anchovy	1	0.02
43	10	2	Spiller Channel	**Pacific herring age-0+**	5579	16.23
				Pacific herring age-1+	7	0.12
				Pacific sardine	483	83.66
44	10	4	Spiller Channel	**Pacific herring age-0+**	7236	18.01
				Pacific herring age-1+	9	0.11
				Pacific sardine	576	92.85
				Sandlance	9	0.02
45	10	3	Spiller Channel	**Pacific herring age-0+**	566	2.24
				Pacific herring age-1+	49	1.50
				Pacific sardine	2	0.30
46	11	2	Hunter Channel	**Pacific herring age-0+**	5160	15.95
				Pacific herring age-1+	12	0.28
				Three-spine stickleback	6	0.02
47	11	5	Hunter Channel	**Pacific herring age-0+**	700	2.67
				Pacific herring age-1+	14	0.48
				Capelin	34	0.05

Table 2 continued...

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
48	11	4	Hunter Channel	**Pacific herring age-0+**	1935	6.60
				Pacific herring age-1+	6	0.13
				Capelin	9	0.01
				Juvenile walleye pollock	9	0.08
49	11	3	Hunter Channel	**Pacific herring age-0+**	88	0.29
				Pacific herring age-1+	8	0.24
				Pacific sardine	146	27.33
				Juvenile walleye pollock	2	0.02
50	11	1	Hunter Channel	**Pacific herring age-0+**	3507	6.46
				Pacific herring age-1+	3	0.04
				Juvenile walleye pollock	6	0.11
				Juvenile rockfish	3	0.01
51	1	1	Fish Egg Inlet	**Pacific herring age-0+**	951	2.36
				Pacific herring age-1+	110	1.73
				Pacific sardine	3151	507.35
				Juvenile walleye pollock	403	2.27
				Three-spine stickleback	145	0.20
52	1	2	Fish Egg Inlet	**Pacific herring age-0+**	373	0.74
				Pacific herring age-1+	37	0.42
				Pacific sardine	5613	512.00
				Juvenile walleye pollock	74	0.59
53	1	5	Fish Egg Inlet	**Pacific herring age-0+**	1086	2.99
				Pacific herring age-1+	194	3.26
				Juvenile walleye pollock	4181	22.79
				Pacific sardine	2719	483.96
				Three-spine stickleback	430	0.40
				Capelin	37	0.04
54	1	3	Fish Egg Inlet	**Pacific herring age-0+**	23579	45.52
				Juvenile walleye pollock	51	0.45
				Pacific sardine	51	10.30
55	1	4	Fish Egg Inlet	Pacific sardine	11950	2001.67
56	14	3	Rivers Inlet	**Pacific herring age-0+**	3204	5.09
				Pacific herring age-1+	20	0.55
				Pacific sardine	2	0.38

Table 2 continued…

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
57	14	5	Rivers Inlet	**Pacific herring age-0+**	352	0.78
				Pacific herring age-1+	36	0.76
				Juvenile walleye pollock	700	3.00
				Pacific sardine	12	1.94
58	14	4	Rivers Inlet	**Pacific herring age-0+**	22275	26.51
				Pacific herring age-1+	132	2.94
				Juvenile walleye pollock	374	2.05
				Capelin	66	0.04
				Chinook salmon	33	0.91
				Juvenile rockfish	22	0.05
59	14	2	Rivers Inlet	**Pacific herring age-0+**	15	0.03
				Pacific herring age-1+	6	0.15
				Capelin	18	0.01
				Pacific sardine	14	2.34
				Chinook salmon	1	0.13

Table 3. Percent occurrence by species in purse seine sets from the 2008 Central Coast juvenile herring survey.

Species Caught		
Common Name	**Scientific Name**	**% Occurrence**
Pacific herring age-0+	*Clupea pallasi* in year of birth	98.3
Pacific herring age-1+	*Clupea pallasi* in first year	79.7
Pacific herring age-2+	*Clupea pallasi* in second or more years	1.7
Capelin	*Mallotus villosus*	27.1
Chinook salmon	*Oncorhynchus tshawytscha*	10.2
Chum salmon	*Oncorhynchus keta*	6.8
Coho salmon	*Oncorhynchus kisutch*	5.1
Eulachon	*Thaleichthys pacificus*	1.7
Juvenile lingcod	*Ophiodon elongatus*	5.1
Juvenile rockfish	*Sebastes sp.*	30.5
Juvenile sablefish	*Anoplopoma fimbria*	1.7
Juvenile walleye pollock	*Theragra chalcogramma*	40.7
Northern anchovy	*Engraulis mordax mordax*	6.8
Pacific sardine	*Sardinops sagax*	40.7
Pile perch	*Rhacochilus vacca*	1.7
Pink salmon	*Oncorhynchus gorbuscha*	3.4
Sandlance	*Ammodytes hexapterus*	18.6
Sculpin	*Leptocottus armatus*	1.7
Shiner perch	*Cymatogaster aggregata*	1.7
Snake prickleback	*Lumpenus sagitta*	1.7
Squid	*Loligo opalescens, Gonatus fabricii*	13.6
Three-spine stickleback	*Gasterosteus aculeatus*	18.6
Tubesnout	*Aulorhynchus flavidus*	1.7

Table 4. Summary of the number of herring sampled including length and weight (range, mean, and standard deviations) for each of the three herring age classes encountered. Total catch in numbers (N) and weight (Wt) of all herring by transect for the 2008 Central Coast juvenile herring survey.

Age-0+			Length (mm)			Weight (g)				
Location Name	Set Code	Sampled	Range	Mean	STDev	Range	Mean	STDev	Catch	Total Catch Weight (kg)
Fish Egg Inlet	1	164	45-90	58	6.62	0.97-9.47	2.16	1.06	25989	51.61
Kwakshua Channel	2	426	30-82	51	5.80	0.28-6.58	1.42	0.72	63402	82.24
Kilditdt Sound	4	333	39-90	54	8.52	0.69-8.58	1.84	1.05	2048	3.62
Meyers Pass	6	403	36-91	53	7.60	0.38-9.30	1.62	0.79	638485	1023.86
Kitasu Bay	7	412	40-69	50	4.09	0.75-3.62	1.43	0.33	27346	40.08
East Higgins Pass	8	407	37-79	55	6.58	0.58-5.52	1.79	0.78	41192	77.73
Powell Anchorage	9	419	39-88	52	5.61	0.66-7.98	1.55	0.74	16333	23.78
Spiller Channel	10	500	51-87	68	6.63	1.40-7.53	3.56	1.15	18866	58.39
Hunter Channel	11	444	49-82	64	6.93	1.27-6.46	3.06	1.01	11390	31.96
Burke Channel	12	401	50-88	65	5.37	1.34-8.29	3.27	0.87	24827	78.94
Dean Channel	13	510	53-79	67	4.05	1.40-5.75	3.41	0.74	5753	19.87
Rivers Inlet	14	316	38-88	52	9.33	0.58-8.70	1.70	1.17	25846	32.42
TOTALS		4735	30-91	58	9.40	0.28-9.47	2.31	1.22	901477	1524.49

Table 4 continued...

Age-1+			Length (mm)			Weight (g)				
Location Name	Set Code	Sampled	Range	Mean	STDev	Range	Mean	STDev	Catch	Total Catch Weight (kg)
Fish Egg Inlet	1	9	97-119	106	6.86	11.12-21.72	15.83	3.48	341	5.41
Kwakshua Channel	2	182	96-158	128	11.25	10.47-55.47	29.04	8.04	1668	47.88
Kildidt Sound	4	189	99-162	128	18.15	12.26-62.84	30.32	13.64	305	9.05
Meyers Pass	6	14	95-136	110	11.10	10.01-29.65	16.91	5.30	14	0.24
Kitasu Bay	7	7	108-139	120	10.36	19.70-40.09	24.62	7.21	60	1.43
East Higgins Pass	8	378	97-162	128	15.79	10.68-63.75	29.16	11.99	3470	106.40
Powell Anchorage	9	16	93-115	101	5.97	9.91-21.76	13.32	3.07	54	0.69
Spiller Channel	10	133	95-161	129	13.06	11.36-59.33	31.25	9.72	147	4.36
Hunter Channel	11	16	100-148	124	12.68	14.00-47.88	29.00	8.36	43	1.17
Burke Channel	12	209	98-149	116	8.85	12.58-42.00	21.62	5.63	2879	61.39
Dean Channel	13	179	97-147	120	8.45	13.60-46.17	25.49	5.57	470	12.18
Rivers Inlet	14	46	93-146	118	13.60	10.48-40.36	23.32	8.37	194	4.40
TOTALS		1378	93-162	124	14.52	9.91-63.75	27.27	10.45	9645	254.59

Table 4 continued…

Age-2+			Length (mm)			Weight (g)				
Location Name	Set Code	Sampled	Range	Mean	STDev	Range	Mean	STDev	Catch	Total Catch Weight (kg)
Fish Egg Inlet	1	-	-	-	-	-	-	-	-	-
Kwakshua Channel	2	-	-	-	-	-	-	-	-	-
Kildidt Sound	4	4	164-187	173	10.08	62.24-78.92	70.55	6.96	4	0.28
Meyers Pass	6	-	-	-	-	-	-	-	-	-
Kitasu Bay	7	-	-	-	-	-	-	-	-	-
East Higgins Pass	8	-	-	-	-	-	-	-	-	-
Powell Anchorage	9	-	-	-	-	-	-	-	-	-
Spiller Channel	10	-	-	-	-	-	-	-	-	-
Hunter Channel	11	-	-	-	-	-	-	-	-	-
Burke Channel	12	-	-	-	-	-	-	-	-	-
Dean Channel	13	-	-	-	-	-	-	-	-	-
Rivers Inlet	14	-	-	-	-	-	-	-	-	-
TOTALS		4	164-187	173	10.08	62.24-78.92	70.55	6.96	4	0.28

Table 5. Grouping of organisms, by phylum with abbreviations from plankton tows from the 2008 Central Coast juvenile herring survey.

Coelenterata	
COEL	Medusae - *Aequorea victoria*
SIPH	Siphonophores
Ctenophora	
CTEN	Ctenophores
Annelida	
POLY	Polychaetes
Mollusca	
GAST	Prosobranch gastropods
LHEL	*Limacina helicina*
OCTO	Octopus larvae
PELE	Pelecypods
Arthropoda	
AMPH	Amphipods
BARN	Barnacle; unknown stage
CLAD	Cladocerans; Podon sp. and Evadne sp.
COPE	Copepods (Table 6 for complete species list)
CNAU	Unidentified copepod nauplii
CRAM	Crab megalopea
CRAZ	Crab zoea
EUPA	Adult euphausiids; mainly *Euphausia pacifica*
EUPL	Larval euphausiids; mainly *Euphausia pacifica*
MYSI	Mysids
SEAL	*Caligus elongatus*
SHRI	Shrimp zoea
Ectoprocta	
ECTO	Ectoprocts; mostly *Membranipora sp.* larvae (cyphonautes)
Echinodermata	
ECHI	Echinoderm larvae
Chaetognatha	
CHAE	Chaetognaths; mostly *Sagitta sp.*
Chordata	
LARV	Larvaceans; mostly *Oikopluera sp.* and *Fritillaria sp.*
FISHL	Larval fish; unknown species
Miscellaneous	
EGGS	Mainly euphausiid eggs, with some teleost eggs

Table 6. Abbreviations for calanoid and cyclopoid copepods identified in plankton samples from the 2008 Central Coast juvenile herring survey.

Calanoid copepods	
ALON	*Acartia longimeres*
CABD	*Centropages abdominalis*
CALA	*Calanus sp.*
CMAR	*Calanus marshallae*
CPAC	*Calanus pacificus*
EBUN	*Eucalanus bungii*
EELO	*Eucalanus elongatus*
ELON	*Epilabidocera longipedata*
JCAL	Juvenile calanoids
MPAC	*Metridia pacifica*
PMIN	*Pseudocalanus minutus*
PPAR	*Paracalanus parvus*
PSEU	*Pseudocalanus sp.*
TDIS	*Tortanus discaudatus*
Cyclopoid copepods	
OITH	*Oithona sp.*
OSIM	*Oithona similis*

Table 7. Number of zooplankton per set per volume (m^3) of water observed in samples from the 2008 Central Coast juvenile herring survey.

Location	Set Code	Station	Volume (m^3)	ALON	AMPH	BARN	CABD	CALA	CHAE	CLAD	CMAR	CNAU
Fish Egg Inlet	1	1	16.2350	69.2	3.0	39.5	11.5	7.6	0.1	51.2	0.1	-
	1	2	15.7863	91.2	0.1	49.0	3.2	-	-	14.2	-	-
Kwakshua Channel	2	4	12.7412	126.2	0.1	61.5	2.2	11.0	0.2	-	-	-
	2	5	14.7639	61.2	-	24.6	3.3	-	-	1.6	-	-
Kildidt Sound	4	2	15.7147	42.8	0.1	321.9	-	6.3	-	16.3	-	-
	4	3	15.8336	184.4	6.3	28.3	50.5	31.1	0.1	-	0.3	12.1
Thompson Bay	5	1	16.6434	160.7	-	136.7	63.8	-	-	23.1	-	-
	5	3	16.3287	431.1	3.9	54.9	127.2	51.0	0.8	35.3	0.1	-
Meyers Passage	6	1	17.2696	145.6	-	168.7	13.7	-	-	22.2	-	-
	6	4	17.7694	422.9	1.8	25.4	37.3	-	-	9.0	-	-
Kitasu Bay	7	1	17.1744	349.5	-	7.5	3.7	9.9	-	-	-	-
	7	2	17.1713	450.4	7.5	-	7.5	4.3	-	-	-	-
East Higgins Pass	8	1	17.9309	401.2	-	3.8	113.5	0.8	0.3	-	2.3	-
	8	4	17.8761	94.4	-	10.7	56.8	-	-	34.0	-	-
Powell Anchorage	9	3	16.8971	29.8	0.1	32.2	5.7	0.4	-	130.7	-	-
	9	4	17.4121	41.4	-	65.7	2.8	-	-	47.8	-	-
Spiller Channel	10	1	16.3485	124.3	0.1	15.8	12.1	0.6	0.1	45.0	-	-
	10	5	16.6396	96.2	2.0	61.7	1.9	-	-	98.1	-	-
Hunter Channel	11	2	16.6441	85.1	-	116.3	-	-	-	46.1	-	-
	11	3	18.1145	42.5	0.4	73.9	0.4	7.7	-	15.9	-	-
Burke Channel	12	3	17.1020	22.3	1.9	14.0	-	0.2	-	29.9	-	-
	12	4	18.0360	18.1	1.6	3.5	-	-	-	13.3	-	-
Dean Channel	13	4	16.0872	90.1	6.0	5.0	-	-	-	234.7	-	-
	13	5	16.8217	1.4	1.4	-	-	-	-	79.4	0.1	-
Rivers Inlet	14	2	16.5725	69.5	2.0	113.9	-	0.1	0.1	86.9	-	-
	14	3	15.7673	58.0	-	111.6	-	0.8	-	121.8	-	-

Table 7 continued…

Set Code	Station	COEL	CPAC	CRAM	CRAZ	CTEN	EBUN	ECHI	ECTO	EELO	EGGS	ELON	EUPA
1	1	0.1	0.1	0.1	4.0	-	-	-	-	-	-	-	3.4
1	2	4.3	-	-	2.9	-	-	-	-	-	-	-	-
2	4	1.8	-	-	0.7	-	-	-	1.3	-	101.7	-	-
2	5	0.1	-	-	3.9	-	-	0.5	7.6	-	41.8	-	-
4	2	2.7	-	0.1	60.9	-	-	-	57.0	-	22.4	-	-
4	3	-	0.1	-	3.3	-	-	-	48.5	-	230.4	-	-
5	1	0.2	-	-	2.1	0.1	-	-	19.2	-	69.2	-	-
5	3	0.1	0.1	-	4.6	-	-	-	-	-	43.1	-	-
6	1	0.1	-	-	1.4	0.1	-	-	1.9	-	1.9	-	-
6	4	-	-	0.1	2.3	-	-	-	-	-	-	-	-
7	1	0.1	-	-	10.8	0.1	-	-	1.9	-	50.3	-	-
7	2	-	-	-	96.9	-	-	-	-	-	164.0	-	-
8	1	0.2	0.1	-	0.8	-	-	-	-	0.1	264.1	-	2.2
8	4	0.2	-	0.1	19.6	-	-	-	1.8	-	25.1	-	-
9	3	0.1	-	-	11.2	-	-	-	-	-	88.1	-	0.1
9	4	-	-	-	33.8	0.1	-	-	-	-	46.9	-	-
10	1	0.1	-	-	0.1	-	-	-	2.0	-	240.8	-	-
10	5	0.1	-	-	4.1	0.1	-	-	3.8	-	315.5	-	-
11	2	0.2	-	-	9.1	-	-	-	-	-	19.2	0.1	2.9
11	3	0.1	-	-	5.3	-	-	-	0.4	-	26.1	-	-
12	3	1.1	-	0.1	0.1	6.4	-	-	-	-	-	-	-
12	4	2.7	-	0.2	0.2	-	0.1	-	-	-	-	-	33.7
13	4	0.4	-	-	-	0.1	0.2	-	3.0	-	-	-	-
13	5	0.2	-	0.1	-	-	1.3	-	0.5	-	-	-	-
14	2	0.1	0.1	-	-	-	0.1	-	-	-	-	-	-
14	3	-	0.1	-	-	-	0.9	-	2.0	-	18.3	-	0.1

Table 7 continued…

Set Code	Station	EUPL	FISHL	GAST	JCAL	LARV	LHEL	MPAC	MYSI	OCTO	OITH	OSIM	PELE
1	1	0.1	-	1.0	-	29.6	-	0.1	-	-	-	3.9	-
1	2	1.0	0.1	2.0	-	26.4	-	-	-	-	-	2.0	-
2	4	1.4	-	-	0.2	16.3	-	-	-	-	-	-	-
2	5	-	-	-	0.3	10.3	-	-	-	-	-	-	-
4	2	6.1	-	-	-	10.2	-	0.1	0.3	0.1	-	-	-
4	3	0.1	-	20.2	-	44.5	0.1	-	-	-	-	-	-
5	1	7.7	0.1	7.7	0.1	11.5	-	-	-	-	-	1.9	-
5	3	35.6	0.1	-	-	3.9	-	-	-	-	-	11.8	-
6	1	1.9	0.1	-	-	11.1	-	-	-	-	-	-	-
6	4	12.9	0.2	1.8	-	12.6	-	-	-	-	-	1.8	-
7	1	9.3	-	-	-	5.6	-	-	-	-	-	5.6	-
7	2	11.2	-	-	-	3.7	-	-	-	-	-	11.2	-
8	1	4.1	0.2	-	-	0.1	-	5.9	-	-	-	3.6	-
8	4	1.8	-	-	0.1	9.0	-	0.1	-	-	-	-	-
9	3	0.9	-	-	-	19.9	-	-	0.1	-	-	-	-
9	4	-	-	-	8.3	0.9	-	-	-	-	-	-	-
10	1	19.6	-	-	-	23.5	-	-	-	-	-	-	-
10	5	5.8	0.1	3.8	19.2	28.8	-	-	1.9	-	5.8	-	-
11	2	-	-	2.9	-	32.7	-	-	0.1	-	-	7.7	-
11	3	11.0	-	2.6	-	26.9	-	-	-	-	-	0.4	-
12	3	-	0.1	-	0.1	124.4	-	-	-	-	-	0.9	-
12	4	-	-	-	-	27.1	-	-	-	-	-	-	1.3
13	4	-	-	3.0	-	44.8	-	-	0.1	-	-	18.9	-
13	5	-	-	1.9	0.1	14.3	-	-	-	-	-	4.8	1.4
14	2	1.9	-	-	-	85.0	-	-	-	-	-	1.9	-
14	3	0.2	-	0.1	-	109.6	-	9.0	0.1	-	-	16.2	-

Table 7 continued…

Set Code	Station	PMIN	POLY	PPAR	PSEU	SEAL	SHRI	SIPH	TDIS
1	1	-	-	-	18.1	-	4.1	0.1	1.0
1	2	-	-	-	12.0	0.1	1.2	-	-
2	4	7.5	-	-	26.4	-	4.0	-	-
2	5	-	0.5	-	6.5	-	0.2	-	-
4	2	-	48.9	-	-	-	19.6	-	2.0
4	3	64.8	2.1	-	16.2	-	2.5	0.1	-
5	1	-	5.8	-	25.4	-	6.3	-	-
5	3	62.7	-	-	205.0	-	0.2	-	-
6	1	-	-	5.6	31.5	-	0.2	-	1.9
6	4	-	-	7.2	56.7	-	0.2	0.1	-
7	1	-	-	-	11.5	-	3.7	-	-
7	2	-	-	-	11.2	-	3.7	-	-
8	1	71.4	0.8	-	142.0	-	0.1	0.1	-
8	4	-	-	-	60.0	-	34.5	-	-
9	3	-	0.2	-	16.6	-	0.1	-	-
9	4	-	1.0	2.8	0.9	-	9.2	0.1	0.9
10	1	-	-	-	51.6	-	0.1	-	-
10	5	-	-	-	-	-	2.0	-	-
11	2	-	2.9	-	10.1	0.1	6.9	-	-
11	3	-	0.1	-	9.2	-	4.4	-	-
12	3	-	-	-	9.4	-	0.1	0.9	-
12	4	-	1.1	-	6.7	-	0.9	-	-
13	4	-	-	-	26.2	-	0.1	0.3	-
13	5	5.7	-	-	9.6	-	-	1.1	-
14	2	-	-	-	57.9	-	0.1	-	-
14	3	-	0.3	-	49.5	-	2.2	-	-